GEOTECHNICAL EXPLORATION

SANTA CLARA VALLEY WATER DISTRICT CREEK MODIFICATION PROJECTS

PART I

MATADERO CREEK AT ALMA STREET
PALO ALTO, CALIFORNIA

CH2M HILL

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GEOTECHNICAL EXPLORATION

SANTA CLARA VALLEY WATER DISTRICT
CREEK MODIFICATION PROJECTS

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MATADERO CREEK AT ALMA STREET
PALO ALTO, CALIFORNIA

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LIBRARY
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SAN JOSE, CALIFORNIA 95118

FRANK M. CORPUZ
Frank M. Corpuz
No. GE 238
Exp 3/31/91

Prepared for

SANTA CLARA VALLEY WATER DISTRICT

by

CH2M HILL, CALIFORNIA, INC.
2107 North First Street, Suite 350
San Jose, California 95131

July 1988

TA705.3P35G41988bc.1

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CH2M HILL

SANTA CLARA VALLEY WATER DISTRICT
CREEK MODIFICATION PROJECT PART II
ADOBE CREEK AT ALMA STREET

SUBJECT:	Addendum to Geotechnical Report Dated July 1988
PROJECT:	SF024297.B1
DATE:	November 10, 1988
PREPARED BY:	John E. Anderson

The geotechnical report for Adobe Creek at Alma Street recommends that backfill be compacted to "at least 90 percent relative compaction, per ASTM D1557" and that foundation stabilization material and crushed rock ballast be compacted to "at least 90 percent of the maximum density as defined by ASTM D4253." It is my understanding that the SCVWD lab will be doing the quality control testing for the project and that they do not have the equipment for doing tests according to ASTM (and AASTHO) standards. They are set up to perform the testing using Caltrans standards. Therefore, specification requirements need to be adjusted to accommodate this.

The Caltrans method of determining relative compaction is California Test 216. This standard, however, is not equivalent to ASTM D1557. ASTM D1557 has a higher amount of compactive effort (56,000 ft-lb/ft^3) per cubic foot of soil than California Test 216 (35,000 to 42,000 ft-lb/ft^3). Because of this difference backfill should be compacted to "at least 92 percent of the maximum density as defined by California Test 216."

Caltrans has no equivalent test to ASTM D4253 (Maximum Index of Soils Using a Vibratory Table). Therefore, the options are 1) leave the density requirement for foundation stabilization material and ballast as is and have the SCVWD send the samples to an outside lab to do this testing; 2) require that such materials be compacted with a minimum of three passes of a vibratory compactor; or 3) require that the in-place density of the material be at least 130 pounds per cubic foot.

In addition, the report recommends a minimum of 12 inches of foundation stabilization material beneath the base slab. This can be decreased to 6 inches.

SFC8/005

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INTRODUCTION

PURPOSE AND SCOPE

This report presents the results of the geotechnical exploration conducted by CH2M HILL for a proposed new Matadero Creek Channel crossing at the Southern Pacific Transportation Company (SPTC) railroad tracks along Alma Street, in Palo Alto, California. The location of the site is shown on the Vicinity Map, Figure 1. These modifications are part of a project sponsored by the Santa Clara Valley Water District to improve the Matadero Creek Channel. The Santa Clara Valley Water District proposes to reroute the existing creek channel and construct a new channel crossing beneath the existing SPTC railroad tracks, as shown on the Site Plan Figure 2. The existing channel crossing will be abandoned.

The purpose of this exploration was to provide geotechnical recommendations for the proposed channel crossing at the railroad tracks. Geotechnical recommendations for other channel modifications upstream and downstream of the proposed crossing at the railroad tracks are not within the scope of this work. Recommendations are based on the following scope of work:

- Subsurface exploration
- Water level monitoring
- Laboratory testing
- Engineering analysis of data
- Preparation of this report

LIMITATIONS

This report has been prepared for the exclusive use of the Santa Clara Valley Water District for specific application to the proposed Matadero Creek crossing at the SPTC railroad tracks along Alma Street, in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from a site reconnaissance and the soil borings. The borings indicate soil and groundwater conditions only at specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata or groundwater variations that may exist between boring locations. During construction, if subsurface conditions vary from those described herein, recommendations in this report may need to be re-evaluated.

CH2M HILL is not responsible for any claims, damages, or liability associated with interpretation or reuse by others of the subsurface data, or engineering analyses by others using the information contained in this report.

PROJECT LOCATION AND SITE DESCRIPTION

The project site is located adjacent to Alma Street between El Carmelo and El Dorado Avenues, in Palo Alto, California, as shown in Figure 1. On the south side of Alma Street and north of the SPTC railroad tracks, the existing channel is concrete-lined and about 10 feet wide at the base. Generally, it has side slopes of 1 horizontal to 1 vertical (1:1). However, adjacent to Alma Street the upper 5 feet of the channel side slope are vertical. At Alma Street, the invert of the existing channel is approximately 12 feet below existing adjacent grade and about 15 feet below the elevation of the railroad tracks.

Natural ground at the site of the planned crossing is relatively flat, with gradients on the order of 2 to 3 percent, sloping from south to north. There appears to be some soil fill, underlying the railroad rock ballast, placed beneath and to the north of the railroad track alignment to establish the desired rail grades. This soil fill thickness appears to taper to zero to the north of the railroad tracks to conform to existing grades adjacent to the existing channel alignment.

On the south side of the proposed railroad crossing there is an electrical substation and residences bordering the railroad property. Along the property line, trees and shrubs line the fence and property walls. There are overhead and underground power lines crossing the site, between the electrical substation and the north side of Alma Street at the creek.

PROJECT DESCRIPTION

General

Two alternative box culvert configurations are being considered. The first alternative configuration is a single box with inside dimensions of 20 feet wide by 9-1/2 feet high. The second alternative is a double box configuration with inside dimensions of each box at 12-1/2 feet wide by 9-1/2 feet high. As presently planned, slope gradients for the proposed crossing will not change considerably from the existing channel profile. Therefore, the invert of the proposed box culvert will be about 15 feet below the top of rail elevation, and the top of the box culvert will be approximately 3 feet below the bottom of rail elevation (depending on the culvert roof thickness). SPTC has established that scheduled weekday rail service along the track will not be disrupted as a result of the proposed construction.

Therefore, construction of the crossing must occur within a 40-hour time period on weekends.

Alternatives

In a concurrent, separate analysis, CH2M HILL has been evaluating several alternative construction schemes for the proposed creek undercrossing at the railroad tracks. These alternatives include:

1. Conventional, cast-in-place concrete bridge, over a U frame channel, with a shoofly rail track in operation during construction
2. Conventional, cast-in-place concrete box culvert with a shoofly rail track in operation during construction
3. Precast concrete bridge with tunneled channel undercrossing (tunneling operation) after new bridge is complete (weekend single rail service will be maintained during construction).
4. Precast concrete, box culvert constructed by open cut and cover or jacking/sliding of the precast sections in conjunction with open cut and cover (weekend single rail service will be maintained during construction)

The presently preferred alternative by SPTC is Alternative 4--the placement of precast units in an open cut or jacking/sliding of the precast sections in conjunction with open cut and cover. The railroad's primary concerns include the time frame for construction, distress to the railroad tracks during construction, and the magnitude of any long-term, post-construction differential settlement of the railroad tracks as a result of the construction.

Presently, the preferred alternative of the design team is also Alternative 4. The conclusions and recommendations presented in this report are directed toward this alternative. Information from the borings, which extended to depths of 95 feet, and associated laboratory testing can be used for further geotechnical evaluation of other alternatives, including deep foundation alternatives.

EXPLORATION AND TESTING

FIELD EXPLORATION

Exploratory soil borings were drilled between October 9 and October 14, 1987. Two borings (MB-1 and MB-2) were made to depths ranging from approximately 80 to 95 feet below the ground surface. The boring were located as close to the railroad right-of-way as possible, without disrupting rail operations. Consequently, no evaluation of ballast thickness or subgrade soils beneath the tracks was possible. Boring locations are presented in Figure 2. Field boring logs are presented in Appendix A.

The borings were vertically advanced with a CME 75 drilling rig using hollow-stem augers. These borings were performed under direct supervision of a CH2M HILL engineer. The drilling rig was equipped with a manually operated hammer for Standard Penetration Tests (SPT).

Disturbed soil samples were obtained at various intervals by the SPT sampler. The number of blows required to drive the sampler the last 12 inches was recorded and reported on the boring logs as the N-value. Relatively undisturbed soil samples were obtained with a thin-walled Shelby tube push sampler. All recovered samples were visually classified by a CH2M HILL engineer in the field in general accordance with ASTM D 2488, Visual Manual Procedure for Description of Soil. In addition, most cohesive soil samples were tested with a Pocket-Penetrometer (PPT) or Torvane (TV). The SPT was performed in approximate accordance with ASTM D 1586, and thin-walled sampling was performed in approximate accordance with ASTM D 1587.

LABORATORY TESTING

Samples obtained during the field exploration were sent to the Harding Lawson Associates laboratory in Novato, California. Disturbed samples were selected for testing of index properties to confirm field classifications and to determine pertinent engineering properties. These tests consisted of natural moisture content, Atterberg Limits, and sieve analyses. In addition, unconsolidated undrained triaxial shear strength tests and unit weight tests were performed on relatively undisturbed Shelby tube samples. The laboratory tests were performed in general accordance with applicable ASTM standards. Results of the laboratory tests are presented in Appendix B.

PRESENTATION OF SUBSURFACE INFORMATION

Field Boring Logs

Field boring logs are presented in Appendix A along with a boring log legend. The field boring logs are a simplified representation of subsurface conditions encountered during the exploration. Some simplification has been necessary because of uncertainties inherent in soil classification.

The ground surface elevations noted on the boring logs were interpolated from the project site topographic map.

Interpretive Boring Logs

Interpretive boring logs are presented in Figures 3 and 4 and include both field and laboratory test results. Detailed results of the field and laboratory tests are presented in Appendices A and B, respectively. The interpretive logs represent a synthesis of the field and laboratory data obtained at each boring location. Lines separating strata on these logs are estimates of the location of stratification changes and may not be representative of conditions at other locations and times.

SITE CONDITIONS

SUBSURFACE CONDITIONS

Soil Conditions

The surface soil is primarily a stiff, fat, black clay that extends to depths of up to 10 feet. Firm to stiff, lean clay interbedded with varying amounts of sand was encountered below the highly expansive surface clay. In Boring MB-2, silty to clayey medium-dense sand was found 15 feet below the surface in a layer about 5 feet thick. In Boring MB-1, at a depth of about 30 feet, medium dense, well-graded sand was encountered to a depth of about 55 feet. Grey, stiff clay was encountered below 55 feet in both borings to the maximum depth explored of 96.5 feet.

Groundwater Conditions

Groundwater was encountered during drilling operations in October 1987, at depths below ground surface of about 15 feet in Boring MB-2 and 18 feet in Boring MB-1. An open well piezometer was installed in Boring MB-2. The water level in Boring MB-2 was 14 feet 9 inches below the ground surface, 39 days after drilling.

Information on any additional groundwater readings made by CH2M HILL before construction bid advertisement would be made available along with the subsurface information contained in this report.

GEOLOGY AND SEISMICITY

A detailed evaluation of site geology and seismicity and their associated hazards is not within the scope of this report. It should be noted, however, that the San Francisco Bay Area is one of the most active seismic areas in the

United States. The site is located 6 miles northeast of the San Andreas Fault. Based upon available regional information there are no faults located at the site. However, due to the proximity and activity of major regional faults, the site is located within Zone 4 of the Uniform Building Code's seismic design provisions.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

From a geotechnical viewpoint, the proposed box culvert alternative is feasible, provided that the following conclusions and recommendations are incorporated into the design and construction of the project. The primary geotechnical features of concern include:

Open-Cut and Cover Box Culvert

- Stability and safety of temporary cut slopes during construction
- Stability of subgrade soils during construction
- Post-construction settlement of backfill adjacent to the box and below railroad tracks
- Rebound settlement of natural clay soils underlying box culvert

Jacking/Sliding Box Culvert

- Jacking forces and required reactions
- Zone of lateral influence during jacking
- Potential post-construction disturbance/settlement effects due to jacking/use of lubricating bentonite
- Stability of the tunneling face during construction

Detailed conclusions and recommendations are presented in the following sections of this report.

EARTHWORK

Excavation

Based upon the available subsurface information, required excavations for the open-cut or jacked box culvert alternatives can likely be made with standard earthmoving equipment.

Dewatering

In order to minimize construction considerations and the potential for adverse affects, it is recommended that the proposed construction take place near the end of the summer months or in early autumn when the groundwater is expected to be at its lowest. Excavation for the open-cut alternative, or excavation for jacking or receiving pits will likely require some form of dewatering, as the observed groundwater level is at approximately the invert of the proposed culvert.

The method of dewatering shall be the responsibility of the Contractor. Furthermore, it should be the responsibility of the Contractor to properly control the groundwater internal and external to the excavation in order to properly complete the project, maintain safety of the excavation, and not adversely affect adjacent property.

Stability and Safety of Temporary Excavations

The Contractor should be responsible for all temporary slopes excavated at the site and the design of any required temporary shoring for jacking and receiving pits. Sloping, shoring, and bracing by the Contractor should be provided in accordance with the governing safety requirements, and the design should account for areas where heavy equipment will be operated or stored near the top of the excavation.

At the base of unshored excavations, adequate distance should be provided between the toe of slope and confined working areas at the base of the excavation to ensure the workers' protection from ravelling slope material and debris.

Material For Backfill

Due to settlement and time of construction considerations, it is recommended that soils removed from onsite excavations not be used for backfill in areas immediately adjacent to or above the box culvert, and below the railroad tracks. The following recommendations for backfill are provided for drained and undrained conditions. A schematic cross-section and summary of the backfill recommendations are shown in Figure 5, Backfill Recommendations.

Drained Conditions. For drained conditions, in the area adjacent to the box culvert, a free draining gravel consisting of either Class 1-Type B, or Class 2 Permeable Material, per Section 68, Caltrans Standard Specifications, latest edition, should be used as backfill in a zone at least 2 feet in width adjacent to the box culvert sidewalls. Use of Class 1B Permeable Material would require a geotextile filter fabric between the permeable material and the structural backfill.

Use of Class 2 Permeable Material would not require a geotextile filter fabric. To facilitate drainage, a minimum 4-inch diameter perforated PVC pipe should be placed within the permeable material blanket and near the base of the box culvert sidewalls. The pipe should be outletted to a suitable discharge point.

Beyond a distance of 2 feet from the box culvert sidewalls, and outside the limits of the railroad tracks, onsite excavated soils can be used as structural backfill. Imported structural backfill should be predominantly granular, with a plasticity index of less than 15 percent, no rocks or lumps greater than 6 inches in greatest diameter, less than 15 percent greater than 2.5 inches, and free of organics and debris.

Undrained Conditions. For undrained conditions, free draining gravel would not be required adjacent to the box culvert sidewalls. Backfill should consist of imported structural backfill as previously described for drained conditions. Beyond a distance of 2 feet from the box culvert sidewalls, and outside the limits of the railroad tracks, onsite excavated soils can be used as structural backfill.

Railroad Ballast and Sub-ballast Materials

For the limits of the overlying railroad ballast section to be replaced, the permeable material and structural backfill should extend to within 12 inches of the bottom of the railroad ballast, and the remaining 12 inches should be backfilled with sub-ballast material. The permeable material and structural backfill should be separated from the subballast by a synthetic geotextile filter fabric. Any required import ballast or sub-ballast material for the railroad should meet the specification requirements of the railroad.

Soil Cap Materials

Beyond the toe of the ballast section, the upper 12 inches of backfill should consist of onsite or imported clayey soils to provide a relatively impermeable soil cap. A filter fabric should be placed between the permeable material backfill and the soil cap.

Foundation Stabilization

For the open cut and cover alternative, we recommend that the box culvert should be underlain by a minimum of 12 inches of foundation stabilization material extending a minimum of 6 inches beyond the plan view limits of the box. Grade for the foundation stabilization material should be established by over-excavating below the required depth for the box.

The foundation stabilization material should consist of a durable, 2-1/2-inch minus, well-graded gravel with less than 5 percent passing the No. 200 sieve.

Geotextile

Geotextile should be used to enclose Class 1B Permeable Material backfill adjacent to the sidewalls for the box culvert alternative. Geotextile should be placed between the natural soils, imported or onsite structural backfill, and Class 1B Permeable Material backfill. In addition, geotextile should be placed directly over Class 1B Permeable Material before placing soil cap fill or railroad subballast materials.

The geotextile should have the following minimum properties:

Grab tensile strength, ASTM D 1682	120 lbs
Trapezodial tear, ASTM D 1117-80	50 lbs
Mullen Burst, ASTM D 3786-80a	210 psi
Equivalent Opening Size	70 to 100

In addition, geotextile material type should be selected based upon drainage/filtering capabilities, adjacent material types, and requirements of SPTC.

Subgrade Observation

Before placing foundation stabilization material for the open cut and cover alternative, the exposed and dewatered subgrade should be observed by a qualified geotechnical specialist or an experienced construction inspector working under the direction of a geotechnical specialist. The purpose of the observation would be to verify subgrade conditions as anticipated from the soil borings.

Based upon our field exploration and a review of the boring logs, it is anticipated that predominantly firm to stiff, sandy, lean clay to lean dry, interbedded with medium dense silty to clayey sand would be encountered at the subgrade elevation. Soft, loose, or unstable soils should be overexcavated and replaced with foundation stabilization material.

Placement and Compaction of Fill

Foundation stabilization material and crushed rock ballast should be placed in loose, uncompacted lift thicknesses not exceeding 6 inches and compacted to at least 90 percent of the maximum index density as defined in ASTM D4253, latest edition.

Structural backfill, permeable material, fill in areas adjacent to structures, and fill that will support structures or other facilities, should be placed in loose, uncompacted lift thicknesses not exceeding 6 inches in thickness, and compacted to at least 90 percent relative compaction, per ASTM D 1557, latest edition.

The Contractor should be responsible for the structural integrity of the sidewalls of the box culvert during backfilling operations.

JACKING ALTERNATIVE CONSIDERATIONS

General

Zone of Lateral Influence. The zone of lateral influence is the zone adjacent to the jacking alignment where horizontal ground displacements associated with jacking forces are large enough to cause significant lateral displacements of the railroad tracks. The zone of lateral influence could extend at least 3 culvert widths from the center line of the proposed jacking alignment. The lateral movements within one culvert widths could be on the order of several inches. Use of bentonite for lubrication could decrease the zone of lateral influence to one culvert width.

Overlying Railroad Ballast. Exploratory borings were not obtainable along the railroad tracks. Therefore, it was not possible to evaluate ballast thicknesses or subgrade soils below the railroad tracks. It should be noted that angular rock ballast has a tendency to migrate into underlying ground because of train vibrations. For the jacking/sliding alternative, rock ballast may be encountered near the top of the opening.

Recommendations for Removal of Existing Overburden. Based upon the large jacking forces, the associated large displacements, and possible ballast pockets in the excavation, it does not appear to be feasible to leave the existing rail in service while jacking. For the box culvert alternative where jacking is utilized, we recommend complete overburden removal above the box, use of bentonite lubrication at the base slab and sidewalls, complete excavation at the tunnel face, and removal of the ballast and railroad tracks to at least 2 culvert widths from the centerline of the jacking alignment.

Estimated Jacking Forces

For the case of complete overburden removal (rail, ballast, and soil), complete excavation at the face of the jacked section, and bentonite lubrication applied to the bottom of the base slab and sidewalls, estimated range of jacking forces is on the order of 400 to 600 tons for a 30-foot jacking length, and 800 to 1,200 tons for a 60-foot jacking length.

Due to the relatively large dimensions of the box culverts, the jacking forces are quite large. Obtaining the required reaction for such large jacking forces would likely require the use of several battered or laterally loaded vertical piles, and/or a surcharge mound to increase available passive resistance. The design of the jacking reaction system would be the responsibility of the Contractor.

Structural design of the box culvert should account for axial compression loading due to the estimated jacking forces during construction.

Stability of Excavation Face

The stability and safety of the excavation face will be dependent on the construction procedures, and will, therefore, be the responsibility of the Contractor. The excavation face will have a 12-foot vertical height. Stability of the tunneling face can be improved by keeping the leading edge of the jacked box culvert ahead of the excavation face as much as possible. The excavation face should not be cut vertically.

DESIGN GROUNDWATER LEVEL

For purposes of structural design for undrained conditions (i.e., no provisions for drainage and relief of hydrostatic pressures behind walls), we recommend a groundwater level at elevation 20 be used in design. This design groundwater level should be considered as a relatively short-duration, low-frequency event.

FOUNDATIONS

For the box culvert alternatives, the maximum bearing pressure for dead plus backfill live loads has been estimated for the minimum dimensions of the box. This estimated maximum bearing pressure is considered low enough to preclude a bearing capacity failure for dead plus backfill live loads.

For design purposes, the maximum bearing pressure should not exceed an allowable value of 1,750 psf for dead plus live loads, and 2,000 psf for all loads including transient wind or seismic loads.

SETTLEMENT

Post-Construction Settlement for Open Cut Alternative

For the earthwork recommendations presented above, the largest contributor to post-construction differential settlement would be the rebound and recompression of underlying, clayey, subgrade soils. The actual amount of settlement will be dependent on the amount of time the excavation is left open and the dead weight of the structure and overlying backfill.

Based upon an estimated range of structure dead weight and the construction time constraints, estimated total settlement for the open cut and cover alternatives would be on the order of 1-1/4 inches or less for settlement due to rebounding/recompression effects. Some of this settlement would occur as the load is applied during the 40-hour construction period.

Estimated post-construction differential settlement of the box culvert would be on the order of 1/2- to 3/4-inch or less over a one year period following construction for settlement due to rebounding/recompression effects. In addition, settlement on the order of 1/2- to 1-inch will probably occur within the adjacent new backfill and new ballast due to fill settlement and train loading over a period of one year after completion of construction. This settlement would result in a surface expression and deflection of the overlying railroad. The railroad grade can be maintained by adding additional ballast as required.

Post-Construction Settlement for Jacked Alternative

During jacking operations, sandy soils below the culvert will be disturbed, but any resulting soil compression should take place relatively quickly during construction. However, where clayey soils are disturbed, the resulting soil compression may take place over a period of time after construction. The amount of disturbance and associated settlement and time rate will be dependent upon many factors including the method and procedures of jacking. Estimated post-construction differential settlement of the box culvert would be on the order of 1/2- to 3/4-inch or less over a one-year period following construction for settlement due to rebounding/recompression effects.

Similar to the cut and cover alternatives, it should be anticipated that jacking alternatives will require some post-construction releveling of the railroad tracks by adding ballast. This is a relatively standard maintenance procedure for most railroads.

Post-Construction Releveling of Railroad Tracks

Post-construction releveling of the railroad tracks will likely be accomplished by SPTC according to arrangements with SCVWD.

SEISMIC DESIGN

The seismic design should be based on the condition that the site is located within Zone 4 of the Uniform Building Code's seismic design provisions.

One seismic hazard considered for this site is soil liquefaction. Liquefaction occurs in saturated, loose, granular soils when water pressures within the soil build up during ground shaking and temporarily reduce soil strength, allowing it to deform. The subsurface information disclosed by the borings indicates the presence of about 5 feet of medium dense, predominantly clayey sand at a depth of 15 feet in Boring MB-2. In Boring MB-1, an approximately 25-foot thick zone of medium dense, predominantly well-graded, silty sand was encountered at a depth of 30 feet below grades. Based upon the medium dense condition and fine content of the sands, liquefaction potential at the site is low and the proposed construction should not be affected by this hazard.

Recommendations for seismic design earth pressure loads for the box culvert sections are discussed in the following subsection, Lateral Earth Pressure.

LATERAL EARTH PRESSURE

The sidewalls of the box culvert should be designed to resist both lateral earth pressures and any additional lateral loads caused by surcharge loads on the adjoining ground above. It is recommended that the sidewalls be designed for a lateral, at-rest, triangular earth pressure of 75 psf per foot of depth for static drained conditions where some form of drainage and hydrostatic relief is provided behind the wall.

For undrained conditions, triangular, lateral hydrostatic pressure of 100 psf per foot of depth should be used starting at the design groundwater level.

In addition to the lateral, at-rest earth pressure, the sidewalls should be designed to resist one-half of vertically applied surcharge loads at the surface, applied laterally against the walls.

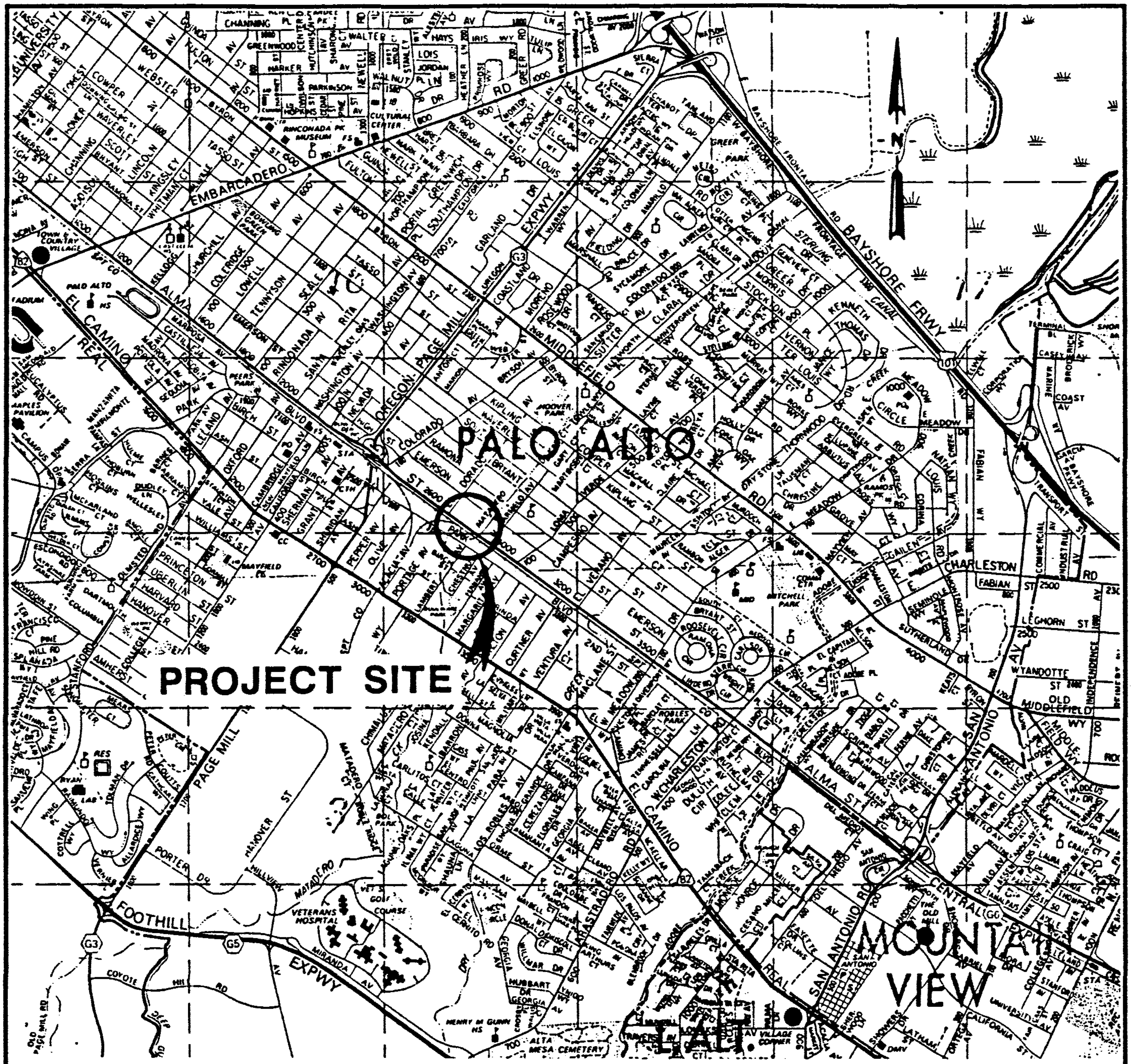
For analysis of seismic earth pressure effects, we recommend that a triangular, lateral earth pressure of 45 psf per foot of depth plus a rectangular, uniform pressure of 20H psf be used in design, where H is the wall height in feet. These recommended pressures are for seismic loading conditions, which are separate from the recommended static lateral earth pressures presented above. Therefore, these pressures for seismic loading conditions are not combined with pressures for static loading conditions.

CONSTRUCTION CONSIDERATIONS

It is neither the intent of this report nor within the scope of geotechnical work to recommend construction methods or procedures. For the proposed facilities, it is the responsibility of the Contractor to implement sound construction methods and procedures in accordance with the strictest governing safety standards.

Variations in soil and geologic conditions are possible and may be encountered during construction. All earthwork and foundation subgrade preparation should be performed under the observation of a geotechnical specialist.

FIGURES



NO SCALE

FIGURE 1
VICINITY MAP

CH2M HILL

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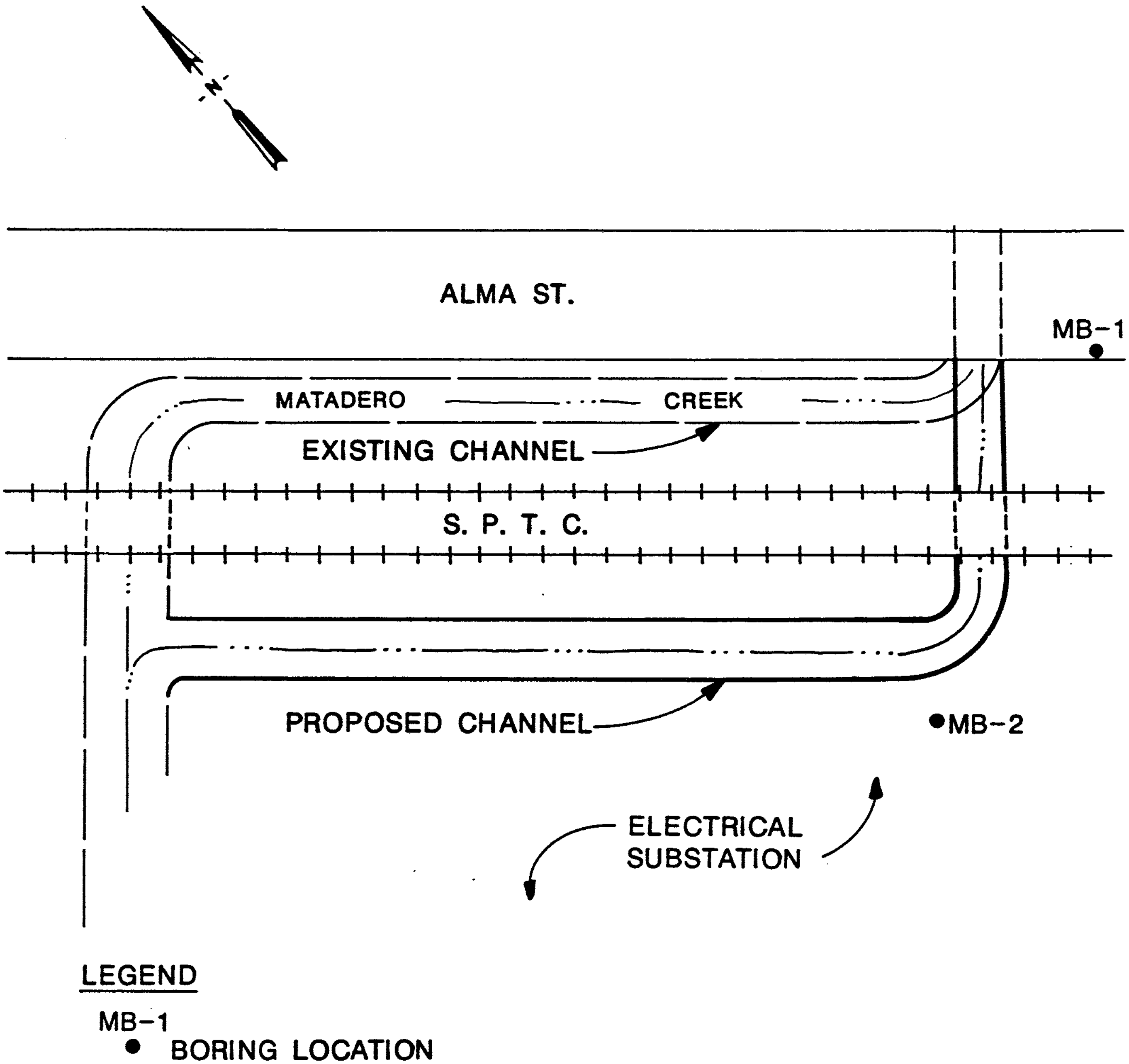


FIGURE 2

SITE PLAN AND
APPROXIMATE BORING LOCATIONS
MATADERO CREEK MODIFICATIONS
PALO ALTO, CALIFORNIA

CH2M HILL

F24297.A1

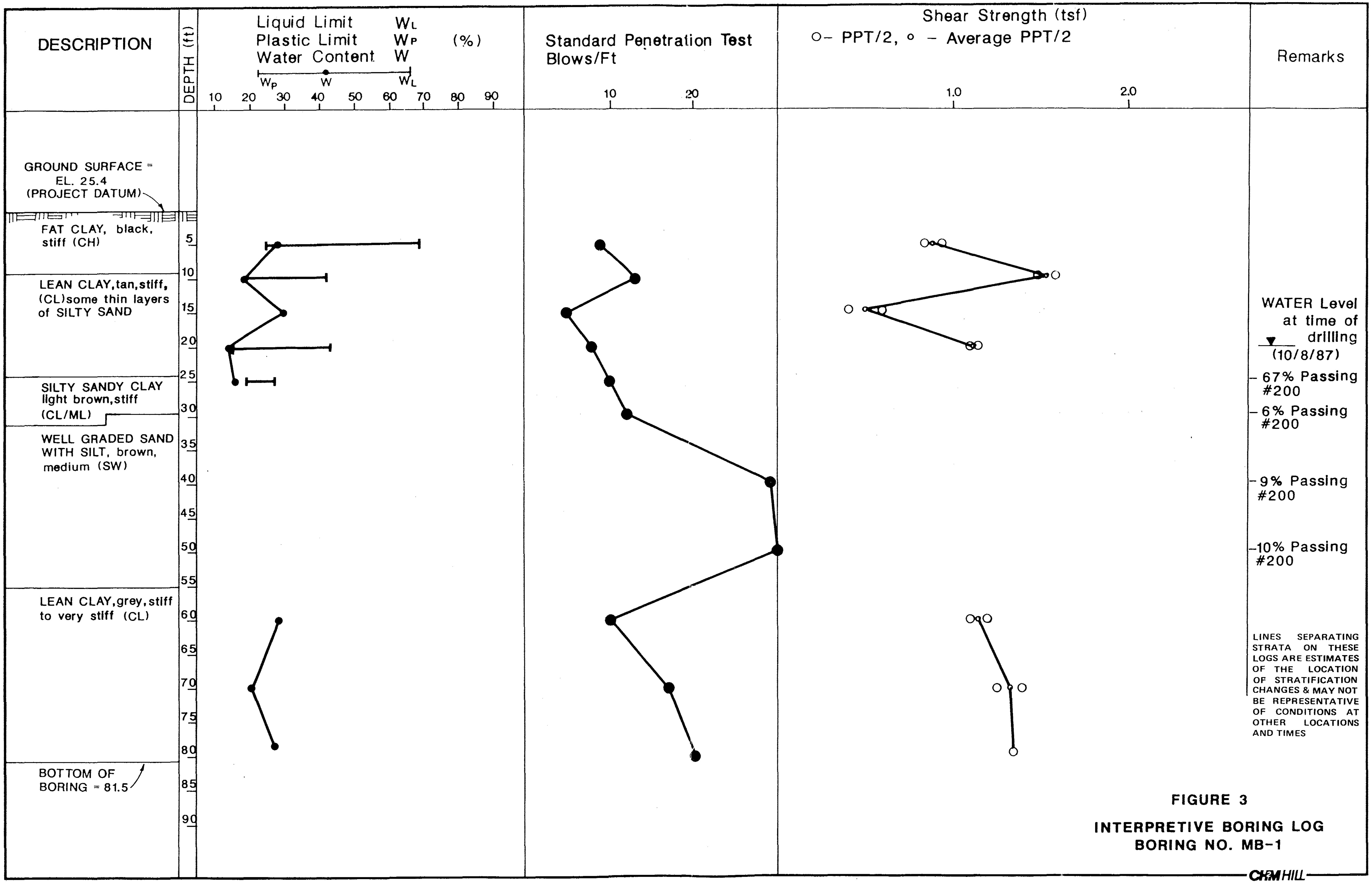


FIGURE 3

INTERPRETIVE BORING LOG
BORING NO. MB-1

CH2M HILL

F24297.A1

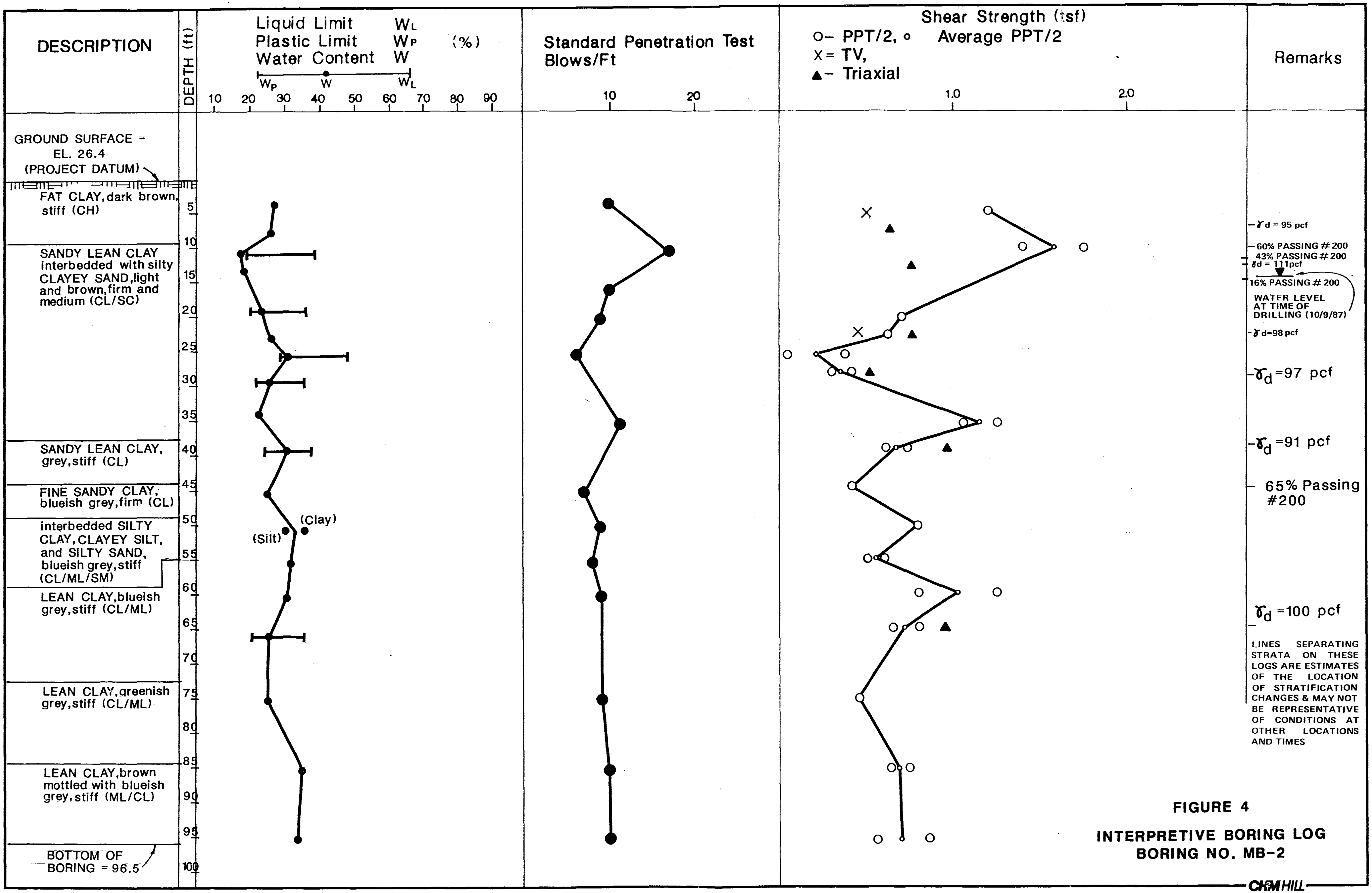
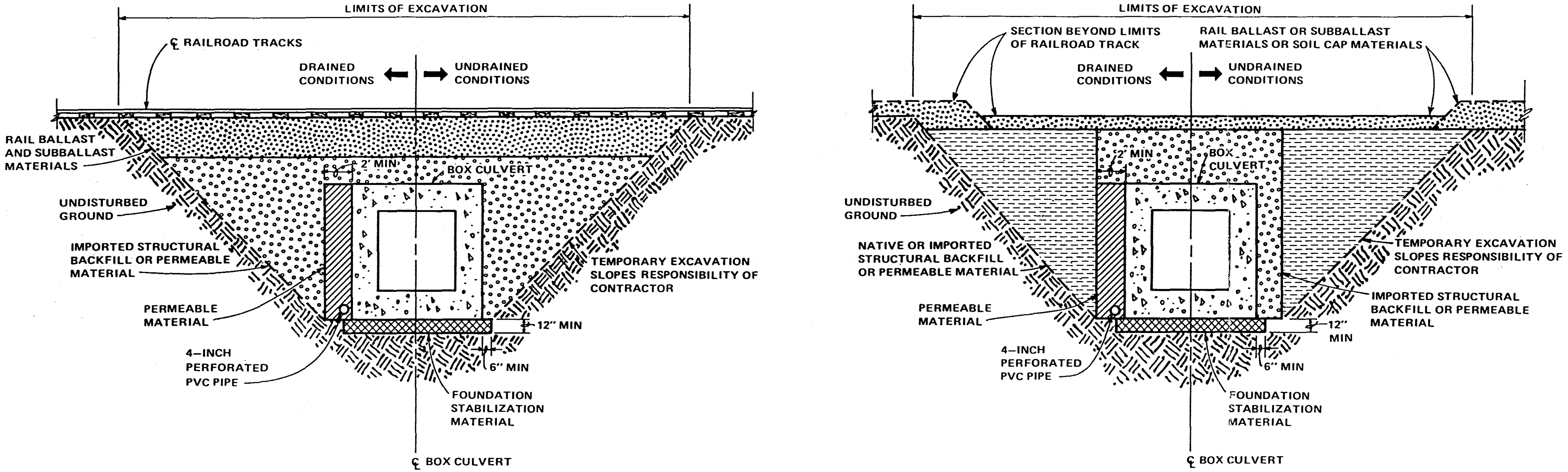


FIGURE 4

INTERPRETIVE BORING LOG
BORING NO. MB-2

F24297.A1


LIMITS OF EXCAVATION
℄ RAILROAD TRACKS
DRAINED CONDITIONS
UNDRAINED CONDITIONS
RAIL BALLAST AND SUBBALLAST MATERIALS
2' MIN
BOX CULVERT
UNDISTURBED GROUND
IMPORTED STRUCTURAL BACKFILL OR PERMEABLE MATERIAL
TEMPORARY EXCAVATION SLOPES RESPONSIBILITY OF CONTRACTOR
PERMEABLE MATERIAL
12" MIN
4–INCH PERFORATED PVC PIPE
6" MIN
FOUNDATION STABILIZATION MATERIAL
℄ BOX CULVERT
LIMITS OF EXCAVATION
SECTION BEYOND LIMITS OF RAILROAD TRACK
RAIL BALLAST OR SUBBALLAST MATERIALS OR SOIL CAP MATERIALS
DRAINED CONDITIONS
UNDRAINED CONDITIONS
2' MIN
BOX CULVERT
UNDISTURBED GROUND
NATIVE OR IMPORTED STRUCTURAL BACKFILL OR PERMEABLE MATERIAL
TEMPORARY EXCAVATION SLOPES RESPONSIBILITY OF CONTRACTOR
IMPORTED STRUCTURAL BACKFILL OR PERMEABLE MATERIAL
PERMEABLE MATERIAL
12" MIN
4–INCH PERFORATED PVC PIPE
6" MIN
FOUNDATION STABILIZATION MATERIAL
℄ BOX CULVERT

BACKFILL RECOMMENDATIONS
BENEATH LIMITS OF RAILROAD TRACKS

BACKFILL RECOMMENDATIONS
BEYOND LIMITS OF RAILROAD TRACKS

FIGURE 5

BACKFILL RECOMMENDATIONS

APPENDIX A--FIELD EXPLORATION

BORING AND TEST PIT LOG LEGEND:

SAMPLE TYPE:

B - BAG SAMPLE
J - JAR SAMPLE
S - SPLIT BARREL (ASTM D1586 UNLESS OTHERWISE NOTED)
W - WASH SAMPLE
ST - SHELBY TUBE
OT - OSTERBERG TUBE
NX - DIAMOND CORE BARREL

STANDARD PENETRATION TEST:

6"-6"-6" - THE NUMBER OF BLOWS FOR THREE 6-INCH INCREMENTS REQUIRED FROM A 140-LB HAMMER FALLING 30 INCHES TO DRIVE A STANDARD 2-INCH O.D. SPLIT-BARREL SAMPLER (ASTM D1586)

(N) - THE SUM OF BLOWS FOR THE SECOND AND THIRD 6-INCH INCREMENTS

SYMBOLIC LOG:

SEE SYMBOLIC LOG LEGEND FOR KEY TO GRAPHIC PATTERN

NOTES:

1. THE BORING AND/OR TEST PIT LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED. SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING AND/OR TEST PIT LOCATIONS. ALSO, THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE LOCATIONS.
2. BORINGS AND/OR TEST PITS WERE LOGGED IN THE FIELD BY A CH2M HILL ENGINEERING GEOLOGIST OR GEOTECHNICAL ENGINEER. SAMPLES WERE EXAMINED AND VISUALLY CLASSIFIED IN APPROXIMATE ACCORDANCE WITH ASTM D2488.

FIGURE A-1

BORING AND TEST PIT LOG LEGEND

CH2M HILL

CH2M HILL

PROJECT NUMBER	BORING NUMBER	SHEET
F24297.A1.03	MB-1	1 OF 3

SOIL BORING LOG

PROJECT SCVWD Bridges LOCATION Palo Alto-Matadero Creek

ELEVATION 25.4 MSL DRILLING CONTRACTOR HEW Drilling Co.

DRILLING METHOD AND EQUIPMENT CME 75, HSA

WATER LEVEL AND DATE 10/8/87, 17' START 1120 10/8/87 FINISH 400 10/8/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					FAT CLAY, black, wet (CH)		
5		S-1	1.5	3 4 5 (9)	FAT CLAY, black, wet, stiff (CH)		PPT = 1.7, 1.8 TSF
10		S-2	1.2	5 6 7 (13)	LEAN CLAY, tan, wet, very stiff (CL)		PPT = 3.0, 3.2 TSF
15		S-3	1.5	1 2 3 (5)	LEAN CLAY interbedded with SILT with thin layers of SILTY SAND, greenish tan, wet, firm and loose (CL, ML, SM)		PPT = 0.8, 1.2 TSF in SILTY CLAY ∇ Groundwater level at time of drilling
20		S-4	1.5	1 3 5 (8)	LEAN CLAY, mottled tan, grey, and orange, wet, stiff, thin threads of white fine sand (CL)		PPT = 2.2, 2.3 TSF
25		S-5	1.5	3 6 4 (10)	SILT, light brown, wet, stiff (ML) SILT WITH SAND, light brown, wet, stiff, contains thin layers of silty sand (ML)		Driller notes sand

CH2M HILL

PROJECT NUMBER	BORING NUMBER
F24297.A1.03	MB-1 SHEET 2 OF 3

SOIL BORING LOG

PROJECT SCVWD Bridges LOCATION Palo Alto - Matadero Creek

ELEVATION 25.4 MSL DRILLING CONTRACTOR HEW Drilling Co.

DRILLING METHOD AND EQUIPMENT CME 75, HSA

WATER LEVEL AND DATE 17', 10/9/97 START 11:30 10/8/97 FINISH 4:00 10/8/97 LOGGER S. Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30		S-6	1.5	2 2 10 (12)	WELL-GRADED SAND, brown, wet, medium, grades fine to coarse with some gravel (SW)		
35							
40		S-7	1.0+	0 10 19 (29)	SAND WITH SILT, brown, dense, grades from fine to coarse with trace gravel (SW)		
45							
50		S-8	0.8	9 19 21 (30)	SAND WITH SILT: SAME AS ABOVE		
55							Driller notes: clay at 55'

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
F24297.A1.03	MB-1	SHEET 3 OF 3

SOIL BORING LOG

PROJECT Scvwd Bridges LOCATION Palo Alto- Matadero Creek
ELEVATION 25.4 MSL DRILLING CONTRACTOR HEW Drilling Co.
DRILLING METHOD AND EQUIPMENT CME 75, HSA
WATER LEVEL AND DATE 17' 10/8/87 START 1100 10/8/87 FINISH 400 10/8/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
60		S-9	1.5	4 5 5 (10)	LEAN CLAY, greenish grey, wet, stiff (CL)		PPT=2.2, 2.4 TSF
65							
70		S-10	1.5	3 8 9 (17)	LEAN CLAY, grey, wet, very stiff		PPT=2.5, 2.8 TSF
75							
80		S-11	1.5	7 10 10 (20)	LEAN CLAY, brownish grey, wet, very stiff (CL)		PPT= 2.7 TSF
		EOB= 81.5'					
85							

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
F24297.A1.03	MB-2	SHEET 1 OF 4

SOIL BORING LOG

PROJECT SCVWD Bridges LOCATION Palo Alto - Matadero
ELEVATION 26.4 DRILLING CONTRACTOR HEW Drilling Co.
DRILLING METHOD AND EQUIPMENT CME 75, HSA
WATER LEVEL AND DATE 15' 10/9/87 START 9:30 10/9/87 FINISH 1000 10/12/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0							
		S-1	1.0	3 5 5 (10)	FAT CLAY, dark brown, moist, very stiff, contains some sand (CH)		PPT >4.5 TSF TV > 2.5 TSF
5		ST-2	2.5	PUSH	FAT CLAY: Same as above but stiff		PUSHING 500 psi PPT = 2.4 TSF TV = 0.5 TSF
10		S-3	1.5	3 7 10 (17)	SANDY LEAN CLAY, tan, dry, very stiff (CL-ML)		PPT = 2.8, 3.5 TSF
		ST-4	2.5	PUSH	CLAYEY SAND, tan, moist, medium, (SC)		PUSHING 450 psi
15							∇ water level at time of drilling
		S-5	0.8	3 5 5 (10)	SILTY SAND, tan, moist, medium, trace gravel (SM)		
20		S-6	1.5	3 4 5 (9)	LEAN CLAY grey and tan, moist stiff (CL)		PPT = 1.4 TSF
		ST-7	2.2	PUSH	LEAN CLAY, mottled tan and grey, moist, firm to stiff, traces of sand and gravel (CL-ML)		PUSHING 400 psi PPT = 1.28 TSF TV = 0.45 TSF
25		S-8	1.5	2 2 4 (6)	LEAN CLAY, mottled tan and grey, moist, soft to firm (CL-ML)		PPT = 0.75 TSF
		ST-9	2.5	PUSH	LEAN CLAY, mottled tan and grey, moist, firm (ML)		PUSHING 325 psi PPT = 0.8, 0.6 TSF

PROJECT NUMBER	BORING NUMBER
F24297.A1.03	MB-2 SHEET 2 OF 4

SOIL BORING LOG

PROJECT SCVWD Bridges LOCATION Palo Alto - Matadero

ELEVATION 26.4 MSL DRILLING CONTRACTOR HEW Drilling Co.

DRILLING METHOD AND EQUIPMENT CME 75; HSA

WATER LEVEL AND DATE 15' 10/9/87 START 8:30 10/9/87 FINISH 10:00 10/12/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30							
35		S-10	1.5	3 5 6 (11)	LEAN CLAY, mottled tan and grey, moist, stiff to very stiff, contains traces of coarse sand (CL)		PPT= 2.5, 2.1 TSF
40		ST-11	2.0	PUSH	SANDY LEAN CLAY, grey, moist, stiff (CL)		PUSHING 300psi PPT= 1.5, 1.25 TSF
45		S-12	1.5	2 3 4 (7)	SANDY CLAY, blueish grey, moist, Firm, sand grades fine (ML)		PPT ~ 0.8 TSF
50		S-13	1.5	2 3 6 (9)	Interbedded SILTY CLAY, SILT, and SILTY FINE SAND, blueish grey, moist, stiff (CL, ML, SM)		PPT= 1.75 in SILTY CLAY
55		S-14	1.5	2 3 5 (8)	SILTY CLAY, blueish grey, moist, stiff (CL-ML)		PPT= 1.2, 1.1 TSF (Tip of sampler contained brown sand)

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
F24297.A1.03	MB-2	SHEET 3 OF 4

SOIL BORING LOG

PROJECT SCVWD Bridges LOCATION Palo Alto, Matadero

ELEVATION 26.4 MSL DRILLING CONTRACTOR HEW Drilling Co.

DRILLING METHOD AND EQUIPMENT CME 75, HSA

WATER LEVEL AND DATE 15' 10/9/87 START 8:30 10/9/87 FINISH 10:00 10/12/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
60		S-5	1.5	3 4 5 (9)	LEAN CLAY, blueish grey, moist, stiff (CL)		PPT = 2.5, 1.6 TSF
65		ST-16	2.6	PUSH	SANDY LEAN CLAY, grey, moist, stiff (CL)		PUSHING 400 PPT = 1.8, 1.3 TSF
70							
75		S-17	1.5	4 4 5 (9)	LEAN CLAY, greenish grey, moist, stiff (CL)		PPT: 0.9, 0.9 TSF
80							
85		S-18	1.5	2 4 6 (10)	LEAN CLAY, brown mottled with grey, moist, stiff		PPT = 1.5, 1.25 TSF

PROJECT NUMBER	BORING NUMBER	
F24297.A1.03	MB-2	SHEET 4 OF 4

SOIL BORING LOG

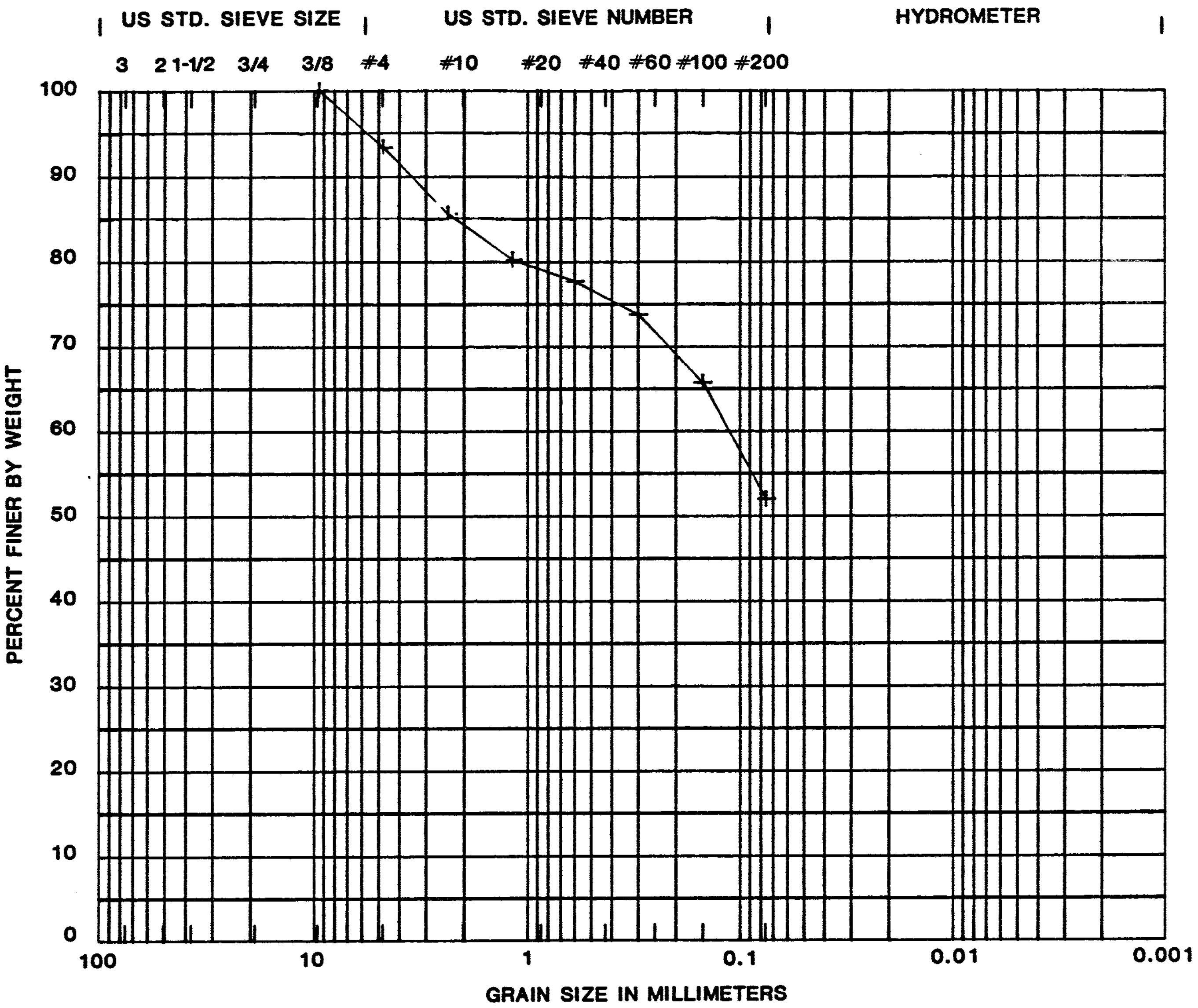
PROJECT SCVWD Bridges LOCATION Palo Alto, Matadero
ELEVATION 26.4 MSL DRILLING CONTRACTOR HEW Drilling Co.
DRILLING METHOD AND EQUIPMENT CME 75, HSA
WATER LEVEL AND DATE 15' 10/9/87 START 8:30 10/9/87 FINISH 1000 10/12/87 LOGGER S Madsen

DEPTH BELOW SURFACE (FT)	SAMPLE			STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
90							
95		S-19	1.5	2 4 6 (10)	LEAN CLAY, brown mottled with blueish grey, moist, stiff (CL)		PPT = 1.7, 1.1 TSF
		EOB = 96.5'					
100							

APPENDIX B--LABORATORY TESTING

Table B-1
SUMMARY OF LABORATORY TEST RESULTS
SCVWD-MATADERO CREEK MODIFICATIONS

							Unconsolidated Undrained Triaxial Compression Test		
Boring Number	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Confining Pressure (psf)	Shear Strength (psf)	Laboratory Description
MB-1	5.0		29	69	26	43			Clay, Black (CH)
MB-1	10.0		19	43	21	22			Sandy Clay, Tan (CL)
MB-1	15.0		31						Sandy Clay, Brown (CL)
MB-1	20.0		15	44	16	28			Clay, Light Brown (CL)
MB-1	25.0		17	28	22	6			Clayey Sand to Sandy Clay Brown (SC-CL)
MB-1	30.0								Sand w/Clay, Grey (SW-SC) (grain size)
MB-1	40.0								Sand w/Clay, Grey (SW-SC) (grain size)
MB-1	50.0								Silty Sand w/Gravel, Grey (SP-SM) (grain size)
MB-1	60.0		28						Clay, Grey (CH)
MB-1	70.0		21						Sandy Clay, Grey (CL)
MB-1	80.0		27						Silt, Dark Brown (ML)
MB-2	3.0		28						Clay, Brown (CH)
MB-2	7.5	95	26				500	1,246	Sandy Clay, Brown (CH)
MB-2	10.0		18	39	19	19			Sandy Clay, Light Brown (CL)
MB-2	13.0	111	19				1,000	1,503	Sandy Clay to Clayey Sand, Brown (CL-SC)
MB-2	16.0								Clayey Sand, Grey (SC) (grain size)
MB-2	20.0		24	37	21	16			Clay, Brown (CL)
MB-2	23.0	98	26	49	19	30	1,400	1,549	Sandy Clay, Brown (CL)
MB-2	25.0		31						Sandy Clay, Light Brown (CL)
MB-2	28.5	97	26	35	23	12	1,500	1,085	Sandy Clay, Brown (CL)
MB-2	34.0		23						Clay, Black (CH)
MB-2	39.0	91	31	38	24	14	1,900	1,967	Sandy Clay, Grey (CL)
MB-2	45.0		26						Clayey Sand, Grey (SC)
MB-2	50.0		36						Clay, Grey (CH)
MB-2	50.0		30						Silt, Dark Grey (ML)
MB-2	55.0		32						Clay, Grey (CH)
MB-2	60.0		31						Clay w/Sand, Grey (CH)
MB-2	66.5	100	25	40	20	20	2,900	1,897	Sandy Clay, Grey (CL)
MB-2	75.0		30						Clay, Brown (CH)
MB-2	85.0		33						Clay, Grey (CH)
MB-2	95.0		28						Clay, Grey (CH)



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-1	25.0	BROWN SANDY CLAY (CL)

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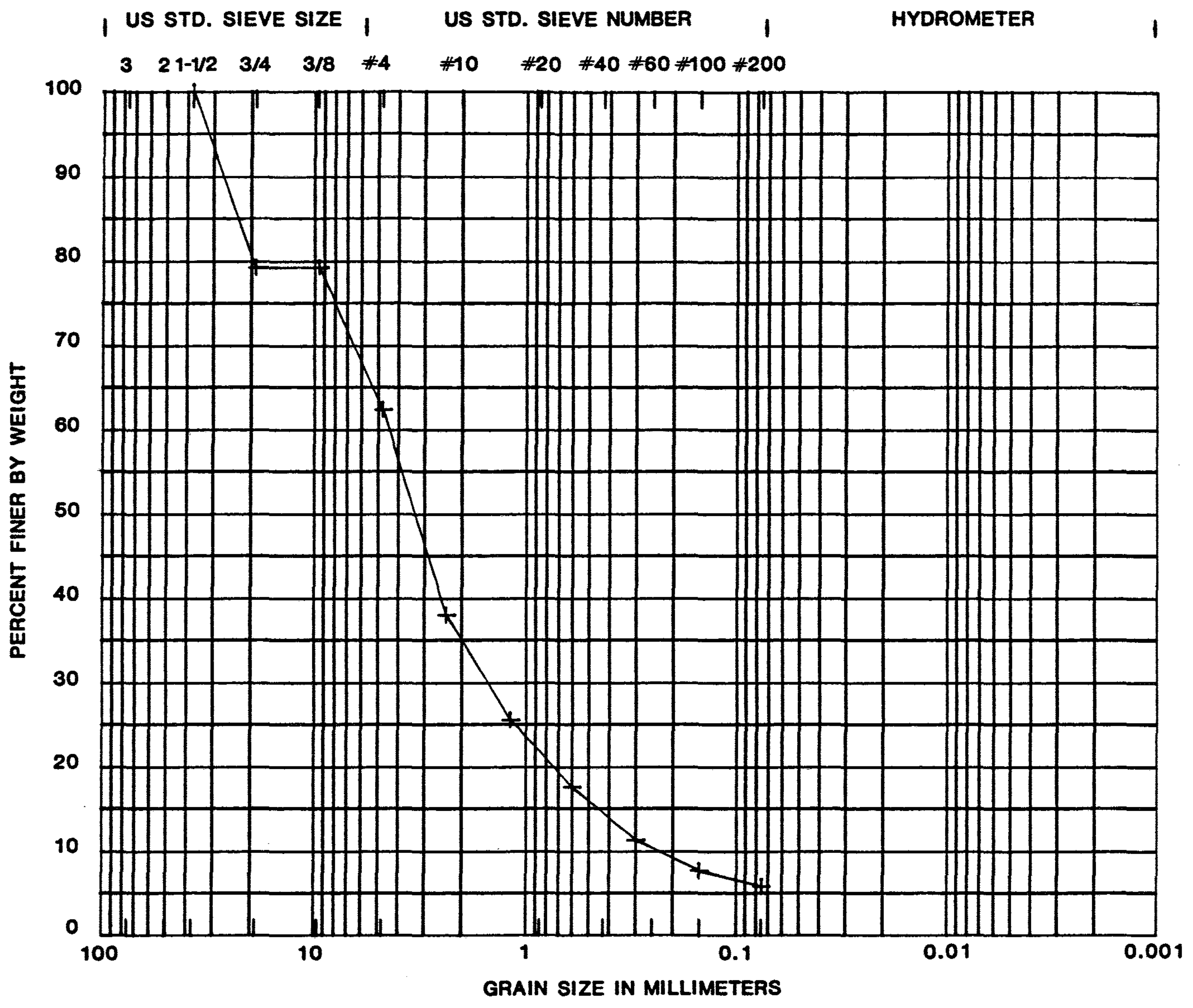
Particle Size Analysis

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	00005561.071.01	BLP	10/87		



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-1	30.0	GREY SAND W/ CLAY (SW-SC*)

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Particle Size Analysis

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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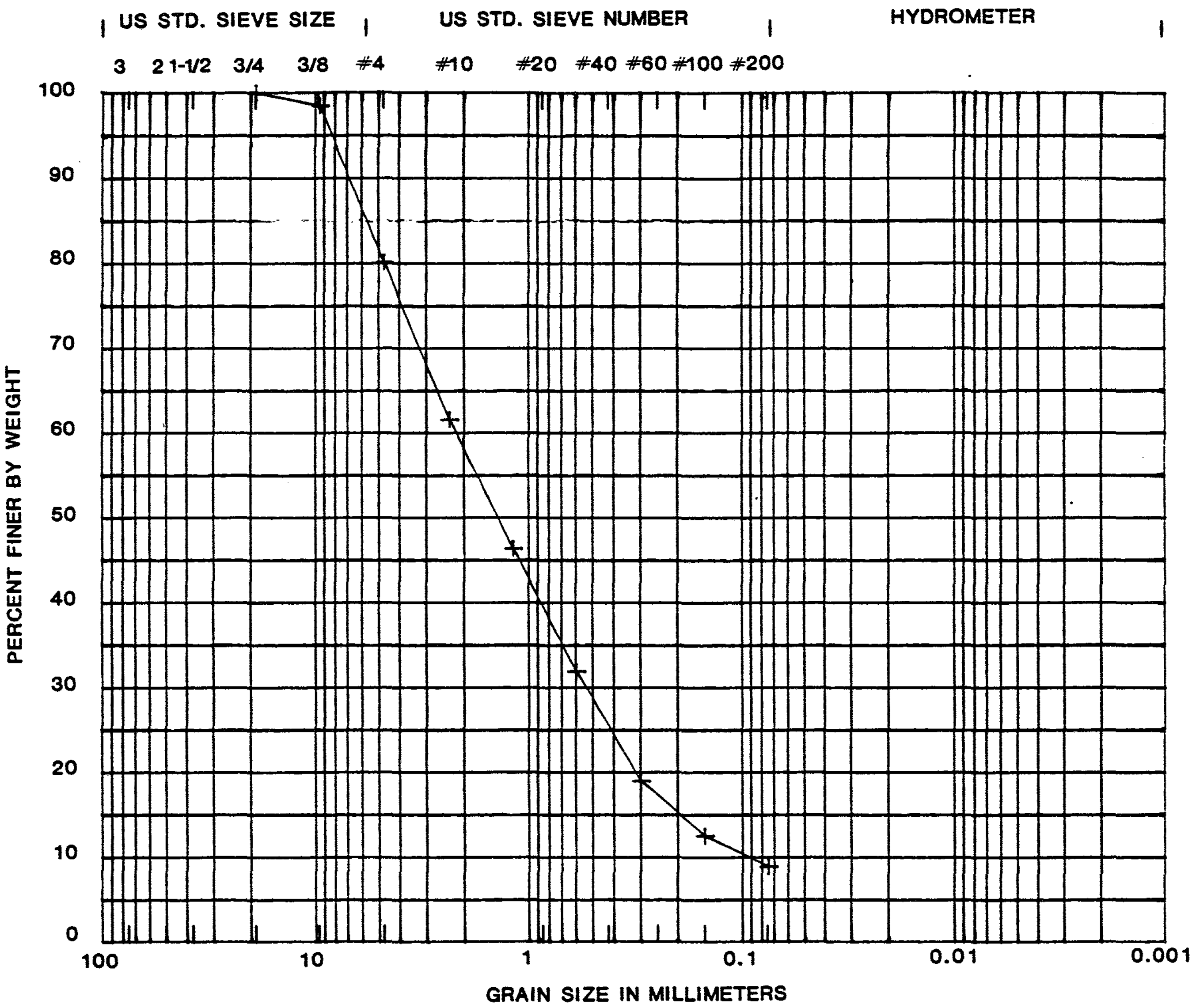

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-1	40.0	GREY SAND W/CLAY (SW-SC*)

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Particle Size Analysis

PLATE

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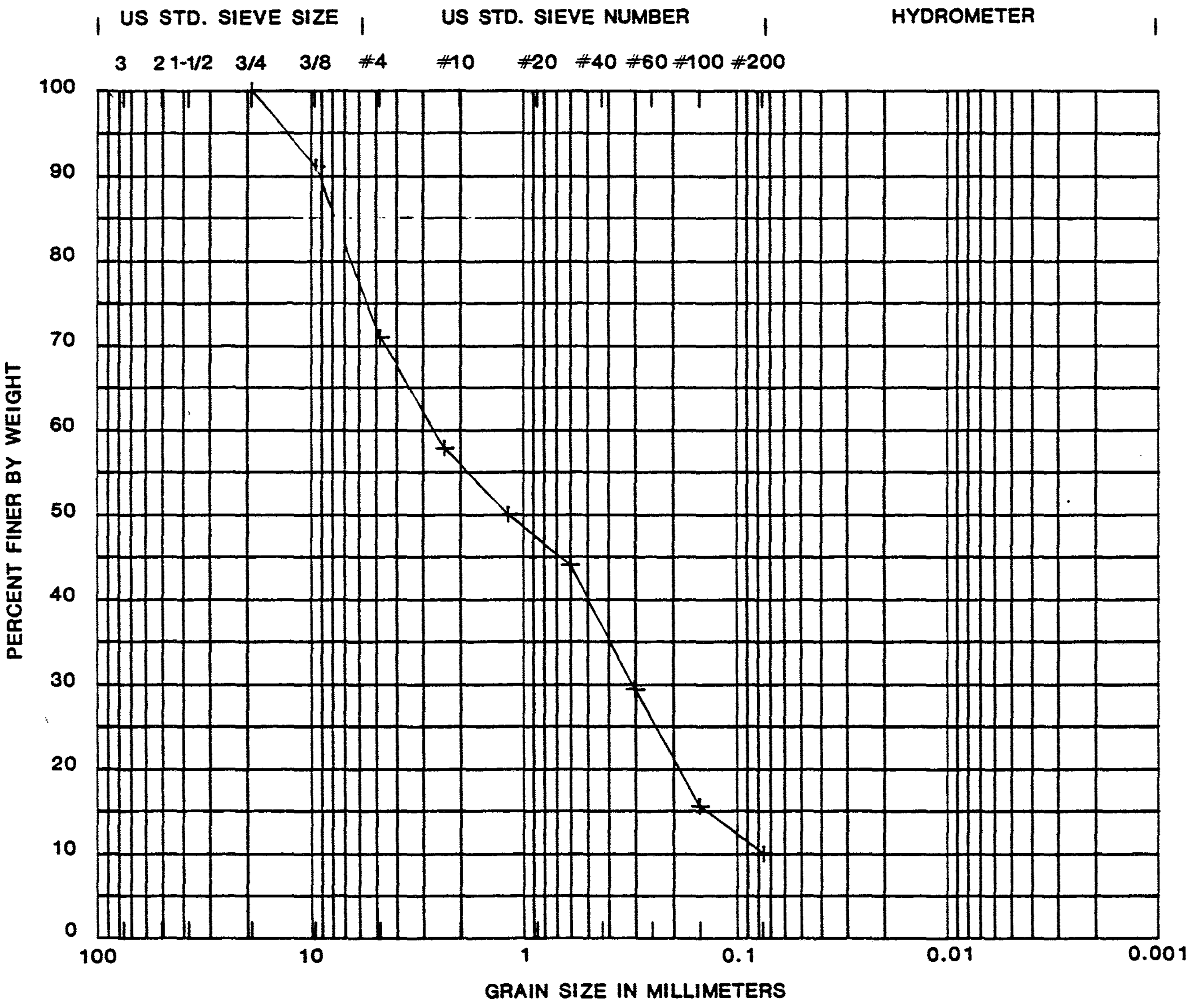

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-1	50.0	GREY SILTY SAND W/ GRAVEL (SP-SM*)

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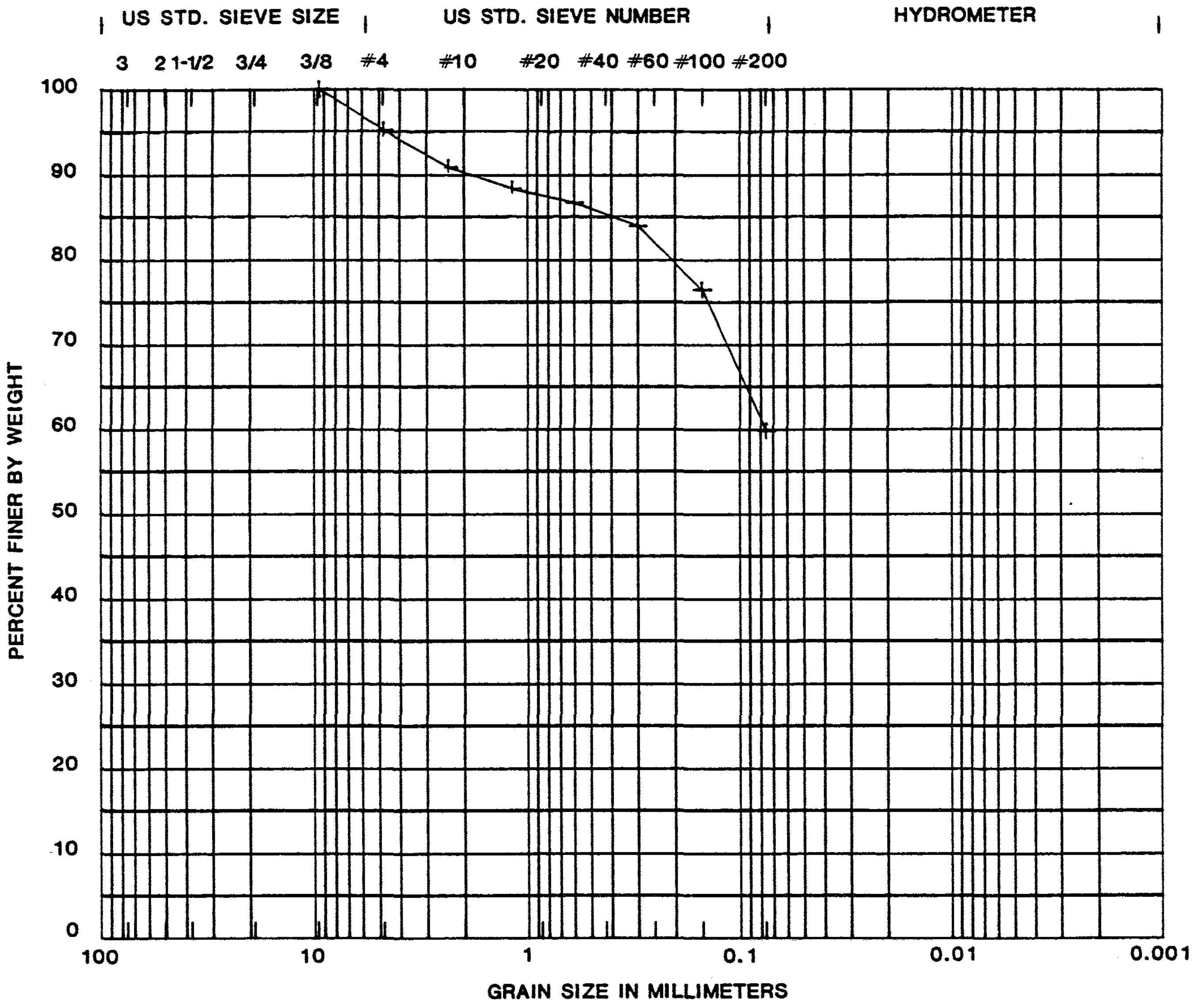
Particle Size Analysis

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	05561.071.01	BLP	01/80		



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-2	10.0	BROWN SANDY CLAY (CL)

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Particle Size Analysis

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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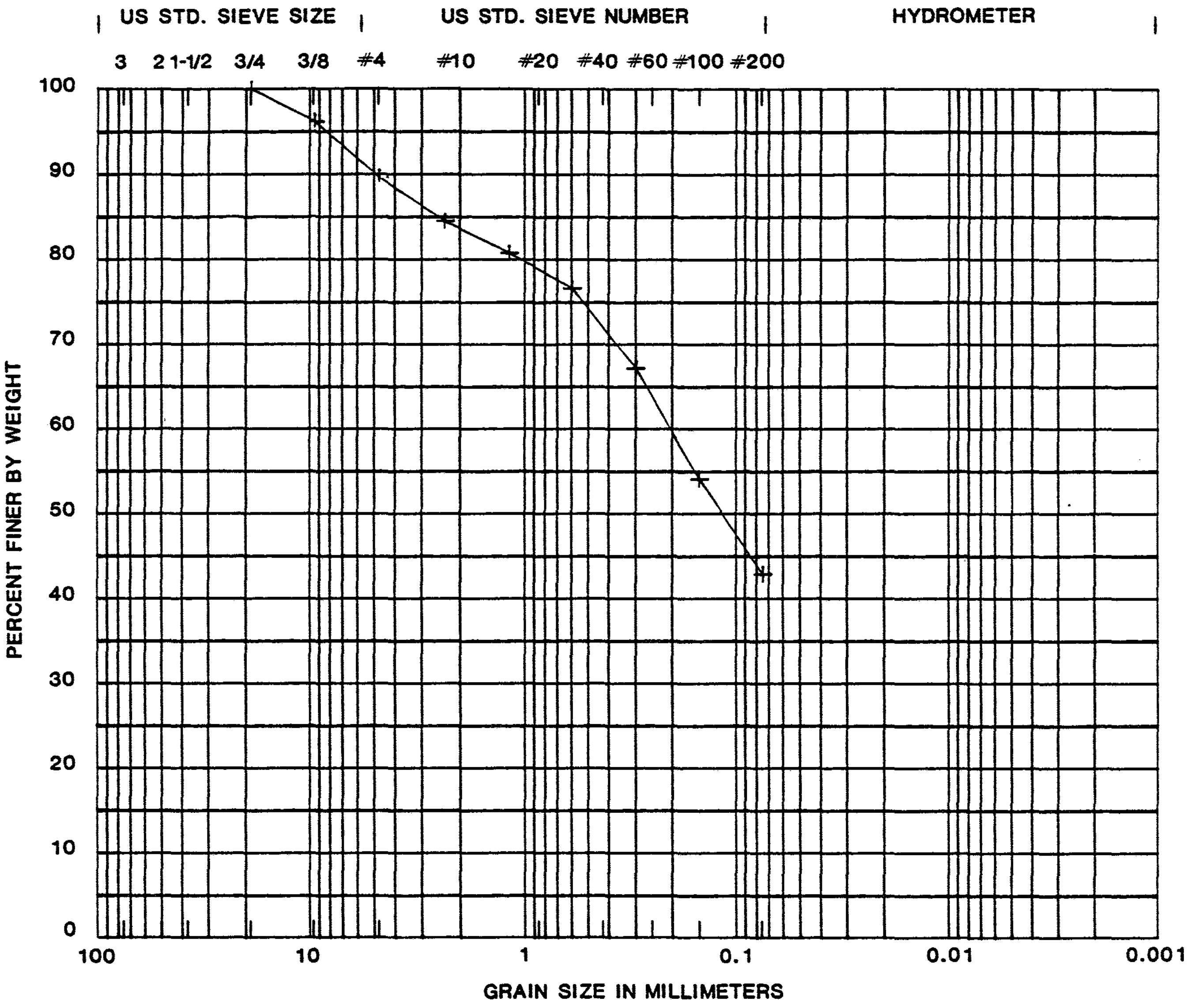

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-2	13.0	BRN GRY CLAYEY SAND W/BRAVEL (SC*)

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Particle Size Analysis

PLATE

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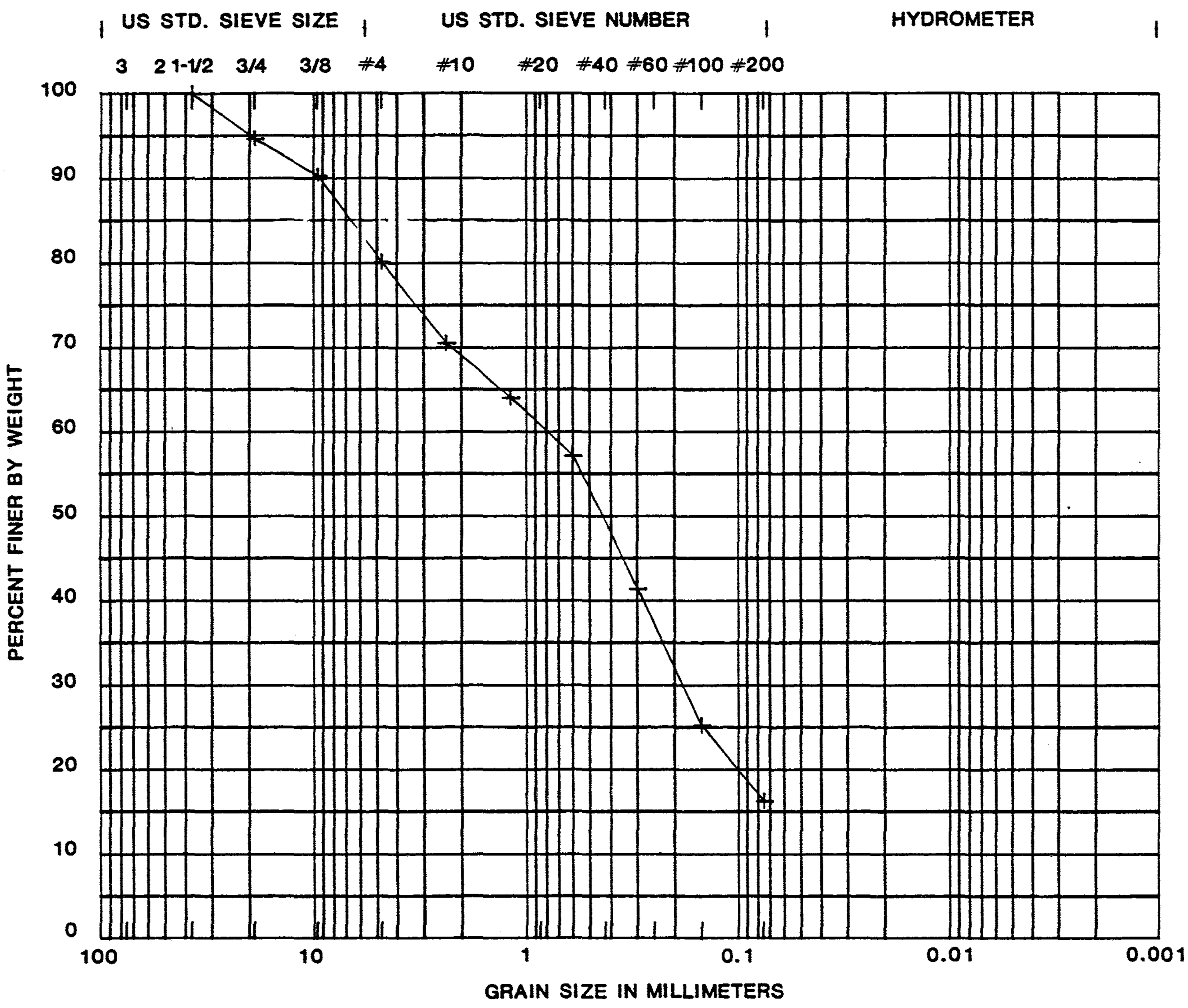

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-2	16.0	GREY CLAYEY SAND (SC*)

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Particle Size Analysis

PLATE

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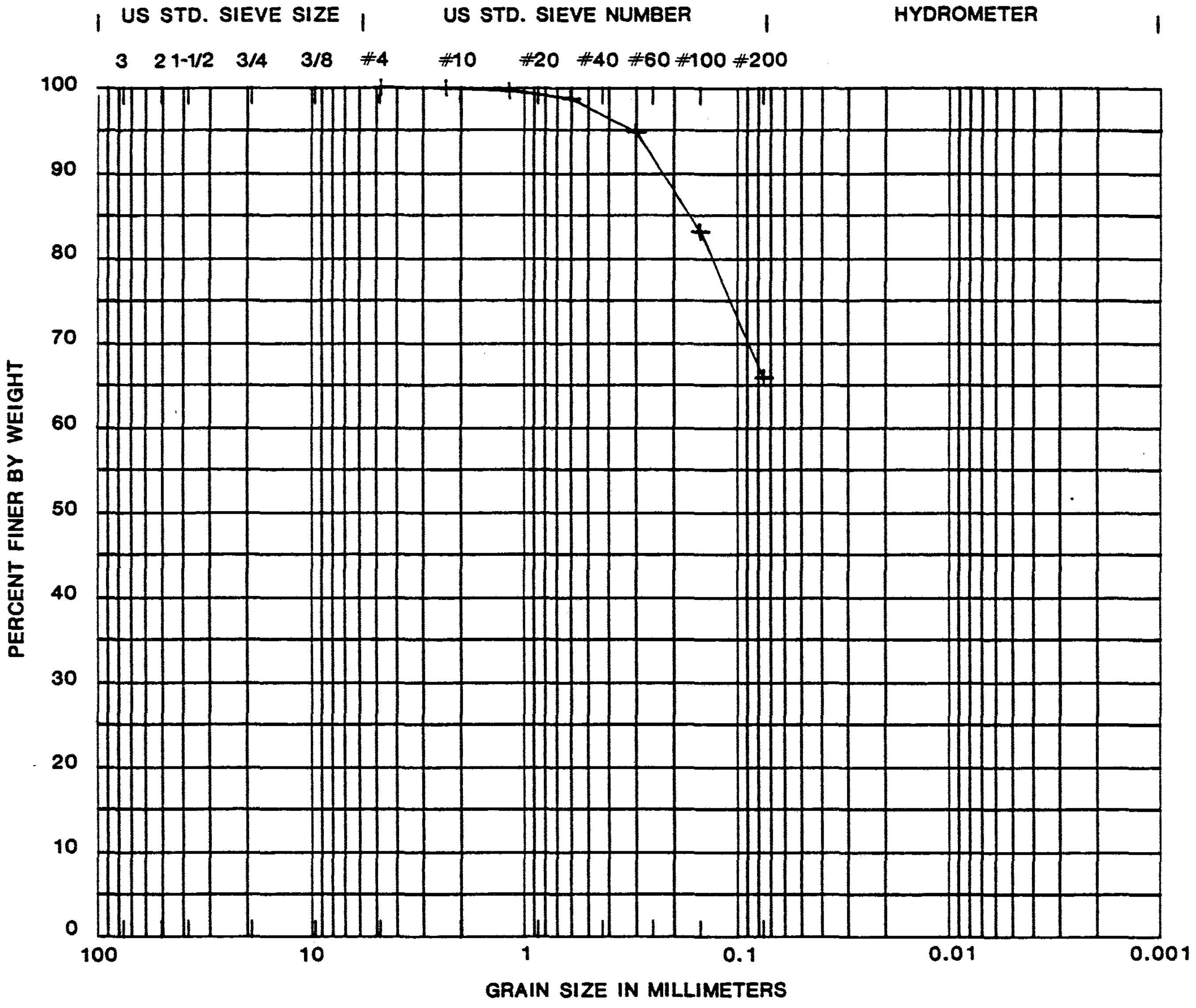

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	MB-2	45.0	GREY CLAYEY SAND (CL*)

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Particle Size Analysis

PLATE

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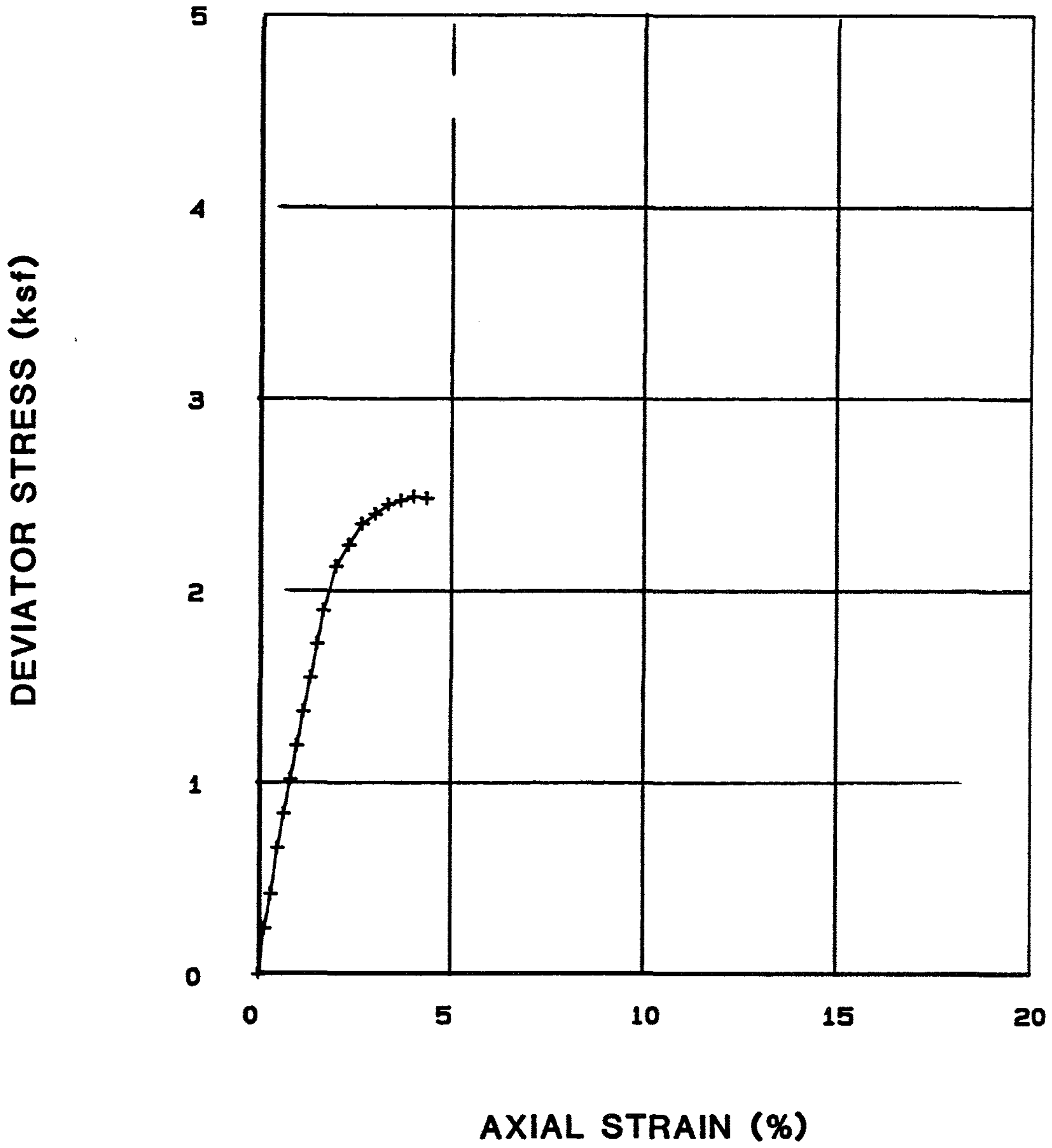

SPECIMEN TYPE	UNDISTURBED		SHEAR STRENGTH	1246	psf
DIAMETER (in)	2.87	HEIGHT (in) 6	STRAIN AT FAILURE	4	%
MOISTURE CONTENT	26.4	%	CONFINING PRESSURE	500	psf
DRY DENSITY	95	pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	BRN SANDY CLAY (CH)		SOURCE	MB-2	@ 7.5 ft

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Unconsolidated-Undrained
Triaxial Compression Test Report

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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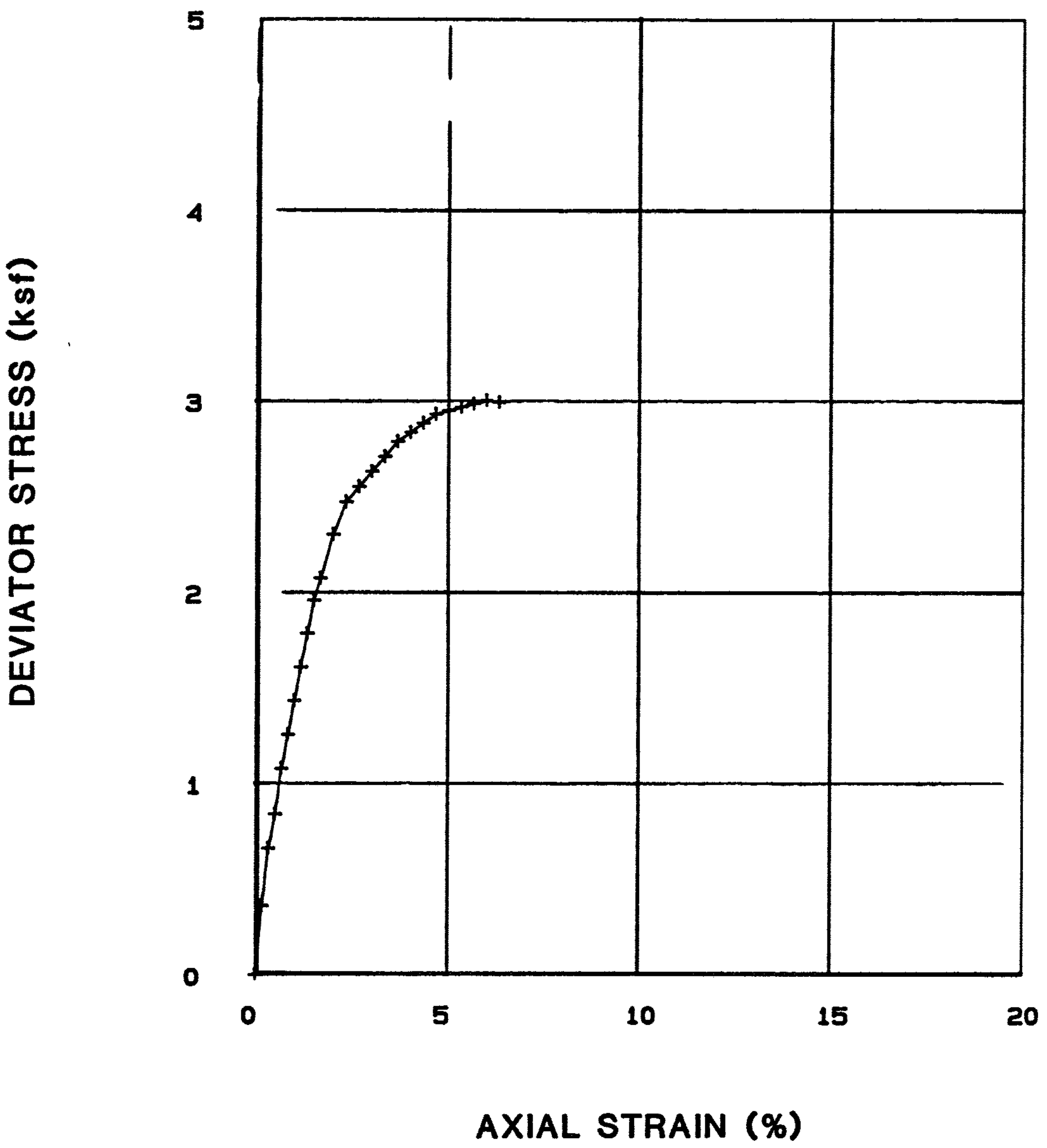

SPECIMEN TYPE	UNDISTURBED		SHEAR STRENGTH	1503	psf
DIAMETER (in)	2.87	HEIGHT (in) 6	STRAIN AT FAILURE	6	%
MOISTURE CONTENT	19.1	%	CONFINING PRESSURE	1000	psf
DRY DENSITY	111	pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	BRN SANDY CLAY (CL)		SOURCE	MB-2 @ 13.0	ft

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Unconsolidated-Undrained Triaxial Compression Test Report

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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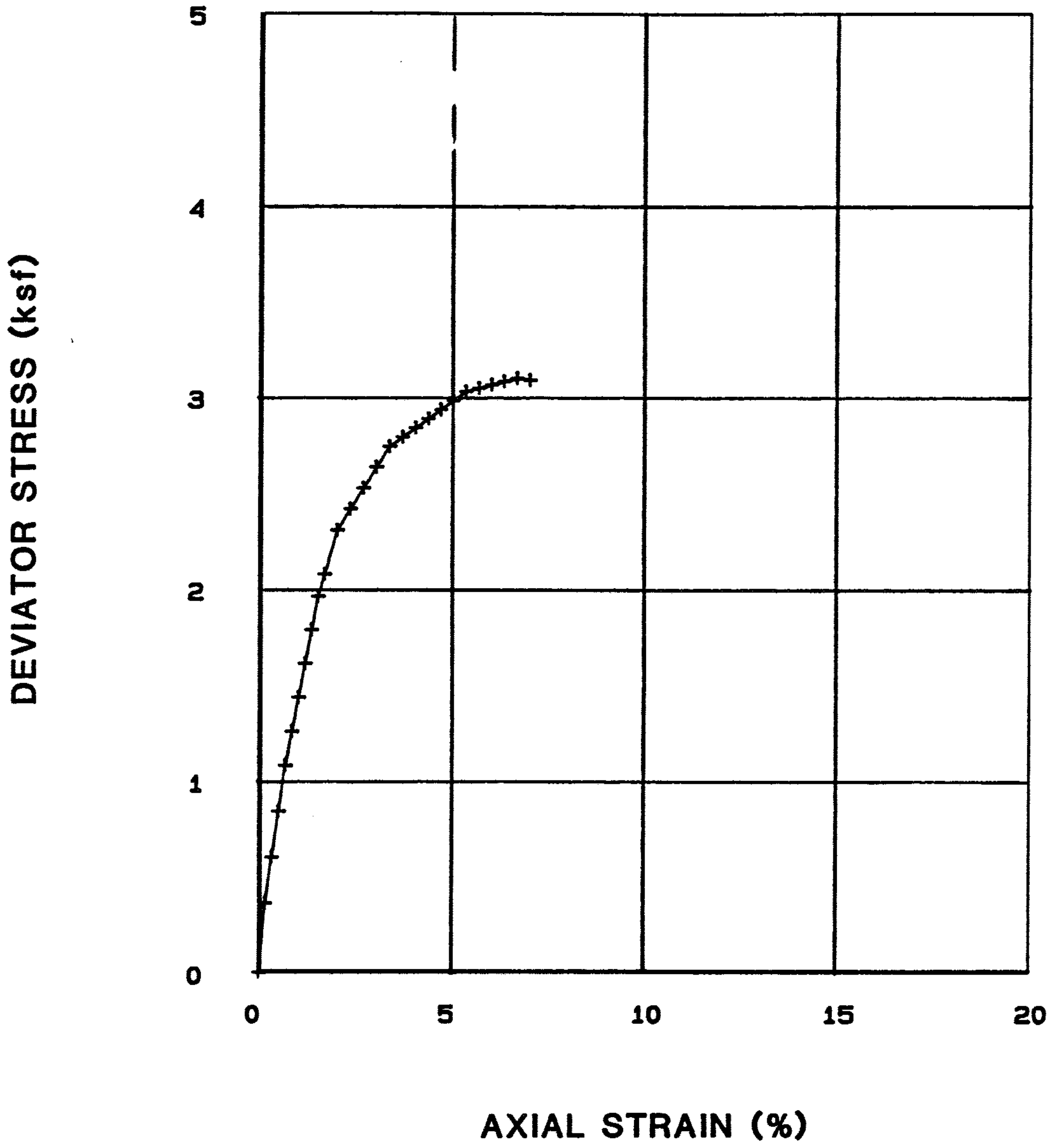

SPECIMEN TYPE	UNDISTURBED			SHEAR STRENGTH	1549	psf
DIAMETER (in)	2.87	HEIGHT (in)	6	STRAIN AT FAILURE	6.67	%
MOISTURE CONTENT	26.2	%		CONFINING PRESSURE	1400	psf
DRY DENSITY	98	pcf		STRAIN RATE	.6	%/min
CLASSIFICATION	BRN SANDY CLAY (CL)			SOURCE	MB-2	@ 23.0 ft

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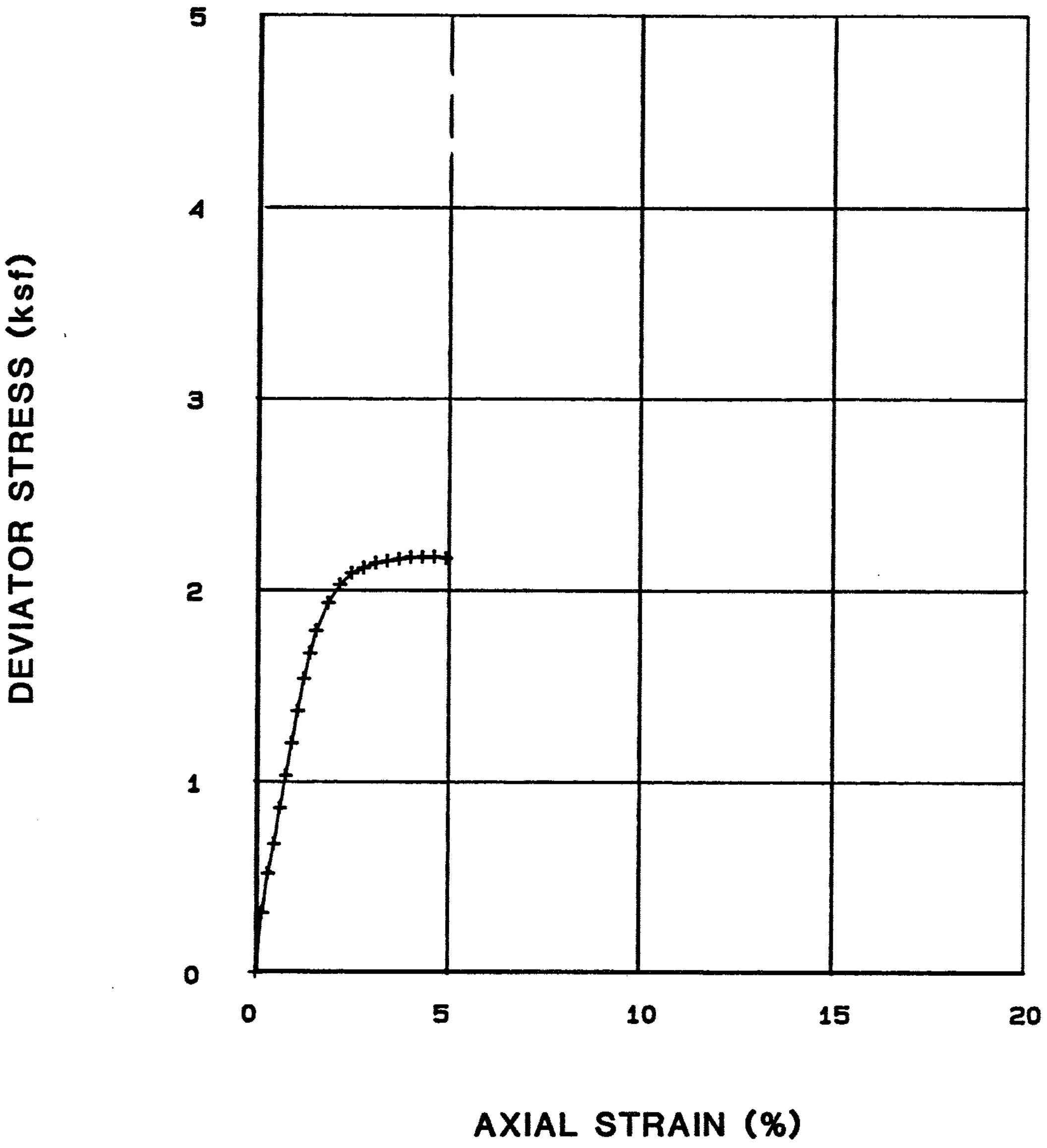
Unconsolidated-Undrained Triaxial Compression Test Report

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	05561.071.01	BLD	10/87		



SPECIMEN TYPE	UNDISTURBED				SHEAR STRENGTH	1085	psf
DIAMETER (in)	2.87	HEIGHT (in)	6.5		STRAIN AT FAILURE	4.62	%
MOISTURE CONTENT	25.6			%	CONFINING PRESSURE	1500	psf
DRY DENSITY	97			pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	BRN SANDY CLAY (CL)				SOURCE	MB-2	@ 28.5 ft

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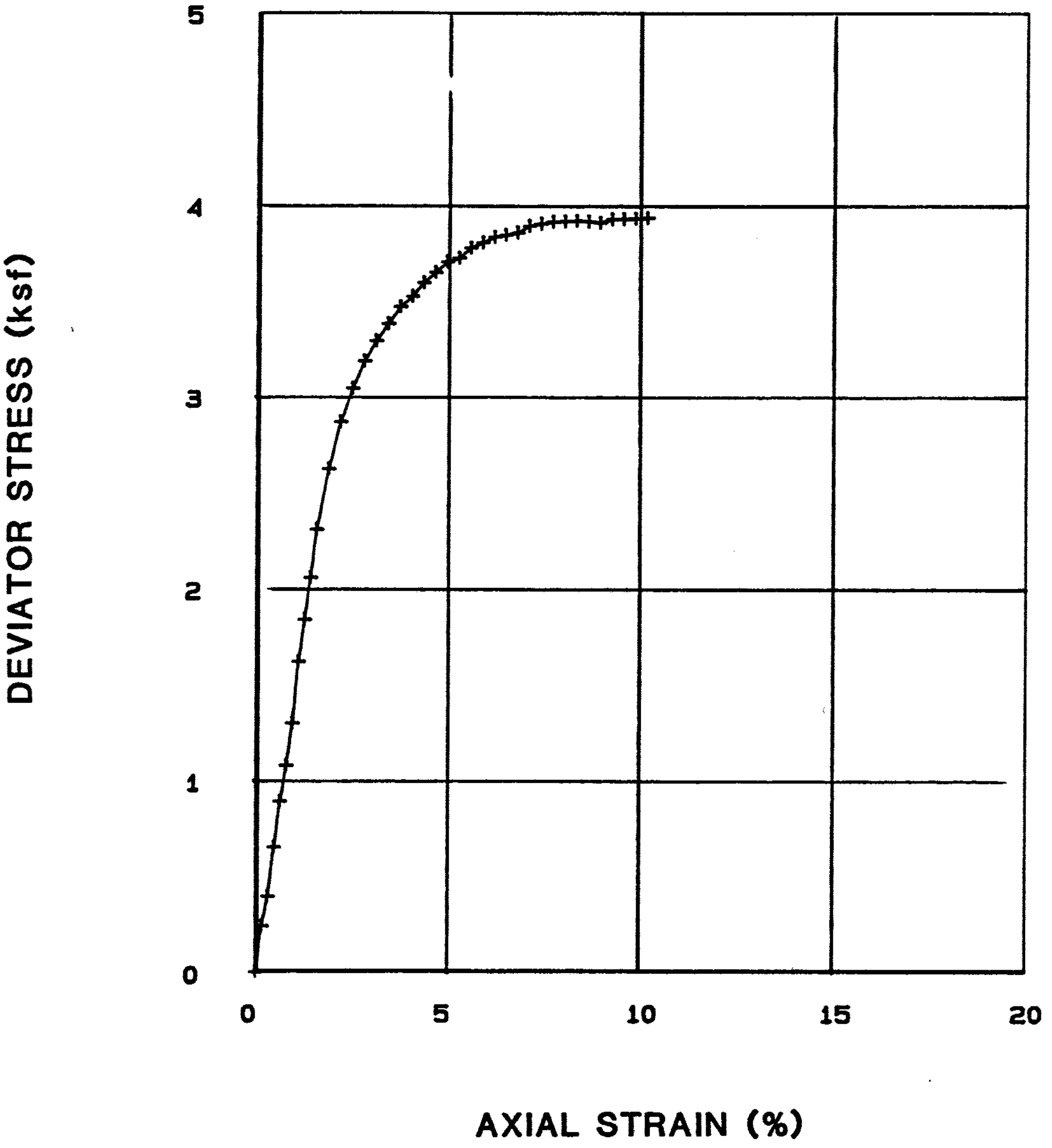

SPECIMEN TYPE UNDISTURBED		SHEAR STRENGTH 1967	psf
DIAMETER (in) 2.87	HEIGHT (in) 6.5	STRAIN AT FAILURE 10.15	%
MOISTURE CONTENT 30.7	%	CONFINING PRESSURE 1900	psf
DRY DENSITY 91	pcf	STRAIN RATE .6	%/min
CLASSIFICATION GREY SANDY CLAY (CL)		SOURCE MB-2	@ 39.0 ft

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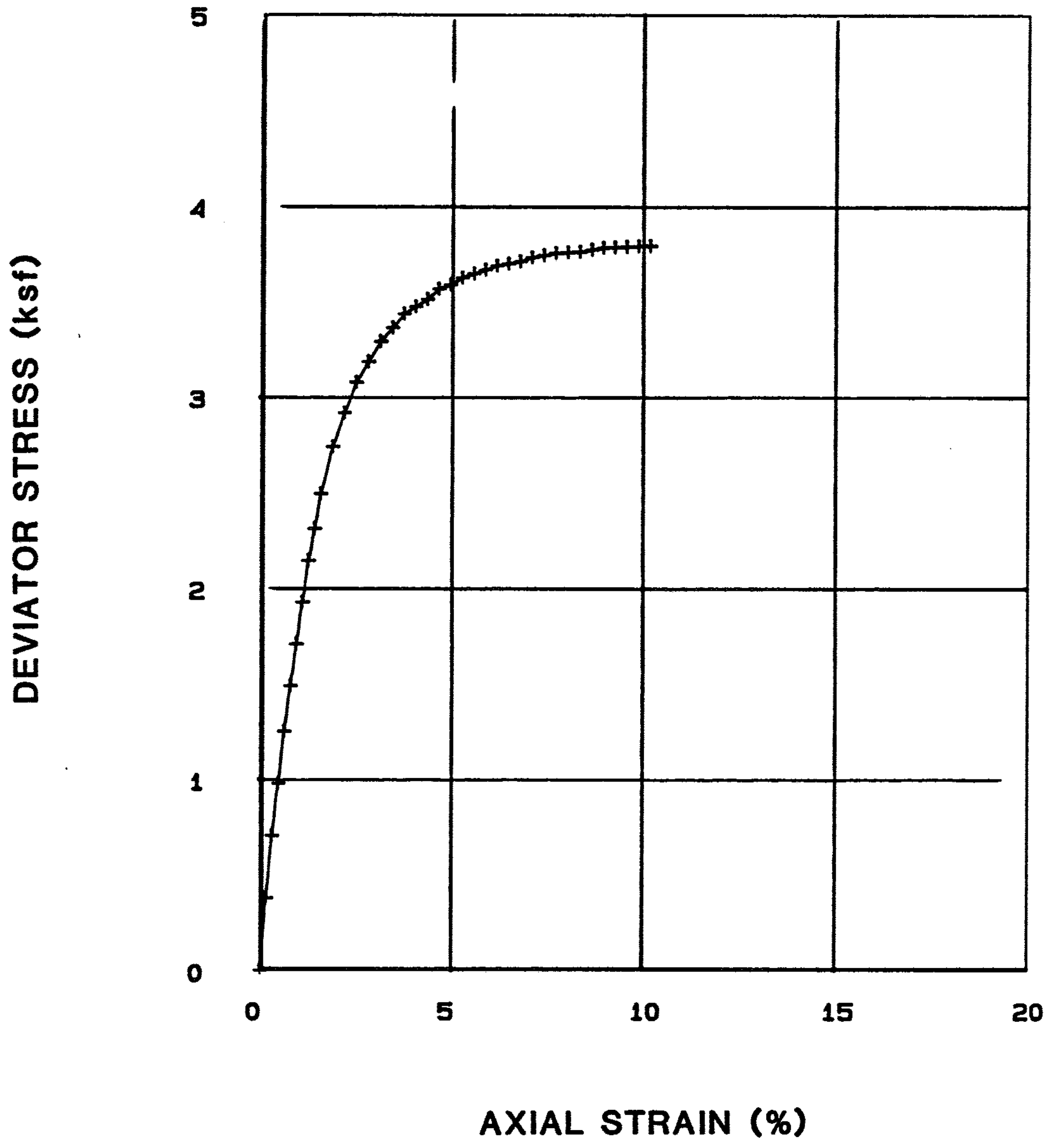
	05561.071.01	BP	10/87		



SPECIMEN TYPE	UNDISTURBED		SHEAR STRENGTH	1897	psf
DIAMETER (in)	2.87	HEIGHT (in) 6.5	STRAIN AT FAILURE	10.15	%
MOISTURE CONTENT	25.2	%	CONFINING PRESSURE	2900	psf
DRY DENSITY	100	pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	GREY SANDY CLAY (CL)		SOURCE	MB-2	@ 66.5 ft

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